wild & rare Riparian Habitat Guide

Introduction

The streams and riparian areas of the Driftless Area suffer from a history of erosion as a result of agricultural land use. Across the region, hundreds of miles of spring creeks have been inundated with soils and fine sediment, which has degraded water quality, increased stream temperatures, damaged aquatic habitat, and altered watershed hydrology. For over 50 years conservationists and conservation organizations have been working to improve Driftless Area streams by stabilizing the streambanks and incorporating habitat for trout. Each year non-profits and federal, state and county conservation agencies spend hundreds of thousands of dollars to stabilize streambanks and create habitat for trout. However, past stream restoration projects in the upper Midwest have often failed to incorporate habitat for non-game species such as snakes, frogs, turtles, and birds, primarily because of a lack of knowledge about those species' habitat needs. Developing habitat for other non-game species at the same time that construction equipment is being used for trout stream projects is efficient and cost-effective. Not combining habitat for these species is a missed opportunity.

This guide is an attempt to assemble information about the amphibians, reptiles and birds that utilize the riparian corridors in the Driftless Area and provide examples of habitat practices that would benefit these species. By integrating one or more of these practices into your project you will be able to make a positive contribution to protecting, preserving, or increasing habitat that is a limiting factor for reptiles and amphibians. Many of the following suggested practices will be helpful for both reptiles and amphibians.

Having a better understanding about the types of amphibians and reptiles that live in your project area and a basic understanding of the biology of them will help you create a better project. A good place to start gathering information on which non-game species would benefit from additional habitat is by reviewing your state's Wildlife Action Plan. All of the states in the Midwest have developed Wildlife Action Plans identifying their Species of Greatest Conservation Need (low and/or declining populations that are in need of conservation action). An even better way to find out what non-game species you have in your area is to contact a local herpetologist or biologist in your area; a biology department at a local university and/or in most states the Department of Natural Resources have dedicated staff that can assist you.

"make a positive contribution to protecting, preserving, or increasing habitat"

Big Spring - Iowa County
Enhanced backwater wetland

Acknowledgments

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This guide is reflective of all the input we received from the "Wild & Rare Committee" that met several times each year for the past three years to tour projects, develop the monitoring plan and provide input to this guide.

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Habitat such as ***woody debris*** that provides refuge for a number of non-game species is often removed in the process of stabilizing the streambanks. Trees that have been washed into the stream that provide habitat for turtles and other non-game species are not anchored and seldom last more than a season before they are washed further downstream and lodge next to a bank where they often accelerate bank erosion.

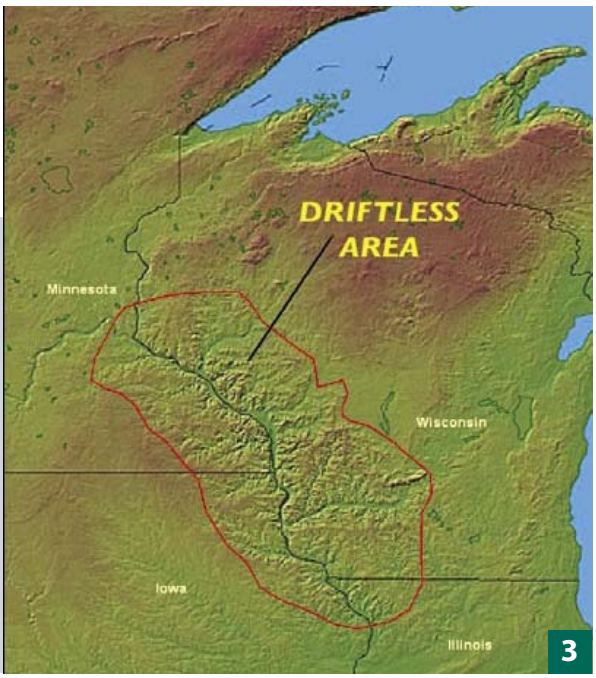
With some thought on placement, large trees that provide basking opportunities for turtles and microhabitats for a number of species can be anchored into the streambank in a matter of minutes, providing permanent habitat in a non-erosive way. The downstream side of woody debris placed adjacent to the streambank will create additional habitat by slowing water movement down and allowing sediment to deposit, creating shallow flats important to both reptiles, amphibians and even shoreland birds.

Deep pools that are critical for over-wintering habitat for many species are also vulnerable. Spring flooding delivers a heavy silt load that can fill in these temporary pools. Constructing a vortex weir (an upstream "V") with large rocks or logs will scour the stream bed bottom and maintain a deep pool. Adding additional rocks or tree roots in the pool will create additional diversity and habitat.

The practices developed in this guide were intended to provide habitat for amphibians and reptiles in the Driftless Area. However, many of these practices would be beneficial outside of the Driftless Area.

Stream Habitats

Woody Debris, Basking Logs, Deep Pools



Located in the heart of the Upper Mississippi River basin, the geographically distinct 24,000 square-mile Driftless Area of southwest Wisconsin, southeast Minnesota, northeast Iowa, and northwest Illinois is interlaced with more than 1,200 streams (more than 4,000 river miles) that spring from the underlying limestone-bedrock.

On October 28th, 2008 a group of regional biologists agreed on a list of Potentially Detectable Amphibians and Reptiles of the Driftless Area Streams and Riparian Habitats of Northwestern Illinois, Northeastern Iowa, Southeastern Minnesota and Southwestern Wisconsin.

driftless area critters

Salamanders

*Blue-spotted salamander

*Central newt

Common mudpuppy

*Eastern tiger salamander

*Four-toed salamander

Frogs

*American bullfrog

*Boreal chorus frog

*Cope's gray treefrog

*Eastern American toad

*Eastern cricket frog

*Gray treefrog

*Northern green frog

*Northern leopard frog

*Pickerel frog

*Spring peeper

*Wood frog

Snakes

Bullsnake

*Common gartersnake

*Common watersnake

*Dekay's brownsnake

Eastern hog-nosed snake

*Eastern milksnake

Gray ratsnake

North American racer

*Northern red-bellied snake

Prairie ring-necked snake

Timber rattlesnake

Western foxsnake

Turtles

Blanding's turtle

*Painted turtle

*Snapping turtle

Spiny softshell turtle

Wood Turtle

* Species most likely to be detected based on habitat preferences.

amphibians

Amphibians *(class amphibia),* such as frogs, toads, newts and salamanders are cold-blooded animals that metamorphose from a juvenile, water-breathing form to an adult, air-breathing form, leading double lives…one in water and one on land. Both frogs and salamanders have thin, semi-permeable skin that needs to remain moist and allows for the exchange of oxygen. Typically, amphibians have four limbs. Amphibians differ in where they spend their non-breeding season. Some species remain in or close to water; others tend to more forested habitats.

Blanchard's Cricket Frog:
newly metamorphosized

"cold blooded animals that metamorphose... leading double lives... one in the water and one on land"

Over wintering habitat:
A few frogs have the ability to withstand freezing. In the Driftless Area the wood frog, western and boreal chorus frog, northern spring peeper, and the copes gray treefrog, can freeze solid during the winter. Frogs are able to do this by generating an "anti-freeze", consisting of high levels of sugars and sugar alcohols in their tissues that keep their cells from freezing (Premo 2005).

Other amphibians avoid freezing by burrowing underground or by submerging themselves under the ice where they are able to take in oxygen through their skin. Toads are terrestrial hibernators; they dig deep where the ground is soft beneath the frost line and spend the winter months in dormancy.

Threats: Frog populations have declined dramatically since the 1950s: more than one-third of species are believed to be threatened with extinction. Habitat loss is a significant cause of frog population decline, as are pollutants, climate change, and the introduction of non-indigenous predators/competitors. Many environmental scientists believe that amphibians, including frogs, are excellent biological indicators of broader ecosystem health because of their intermediate position in food webs, permeable skins, and their double life.

Habitat: Each amphibian species has its own optimum pond conditions for breeding. However, ephemeral (temporary) ponds often created by spring snow melt and rains are essential because they do not support fish which are major predators of amphibian eggs and larvae. Late spring breeding amphibians like the American toad, Cope's gray tree frog and the eastern gray treefrog are also most productive in ephemeral ponds because of the lack of fish predators. The optimum breeding temperature for this group usually occurs when water temperatures are about 60° F (Christoffel et al. 2002).

Summer breeding amphibians like the Blanchard's cricket frog, bullfrog, green frog and mink frog are generally associated with permanent water. Their peak summer breeding occurs in water temperatures around 70° F. Because this group is associated with permanent water where fish are often present, their numbers tend to be smaller (Christoffel et al. 2002).

Permanent Water Area:
Created from hillside seeps

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Recovery Plans for Aquatic-breeding Amphibians

Raymond D. Semlitsch, in his manuscript, Critical Elements for Biologically Based Recovery Plans of Aquatic-Breeding Amphibians, presents key elements needed to develop biologically based recovery plans for aquatic-breeding amphibians that are applicable to most species and regions. Semlitsch states that the scale of the recovery, restoration, or conservation effort (i.e. single population or species range) determines which elements should take the highest priority in any particular plan. The particular threat a species faces—for example, recovery from local chemical pollution or fish invasion, or from a regional disease outbreak, will determine the spatial scale.

East Branch of the Pecatonica: *Cricket frog & stream restoration project.*

For amphibians, local population dynamics and the ecological connectivity of populations are critical to any effective conservation plan. Recovery efforts at the local population level must be coupled with consideration of metapopulations to ensure long-term persistence, because pond-breeding amphibian populations vary widely in size, have episodic recruitment, are subject to local extinction , and depend on recolonization. A metapopulation is a set of local populations (number or density may vary with landscape or region) connected by processes of migration, gene flow, extinction, and colonization (Semlitsch 2002).

Ecological connectedness is critical to maintaining amphibian metapopulations. Reduced pond density increases the distance between neighboring ponds, thereby affecting critical recolonization processes. Because most individual amphibians cannot migrate long distances because of physiological limitations on water loss. One way to help increase the probability of dispersal is the maintenance of corridors of natural vegetation between wetlands. Highly fragmented landscapes that isolate ponds at distance over 1.0 km can result in a lack of recolonization and an absence of species in the landscape (Laan & Verboom 1990).

b ***Duck Egg:*** *Vernon County Wisconsin.*

Though it is clearly more desirable to prevent natural breeding ponds from being lost, restored wetlands do provide adequate habitat for at least a subset of the amphibian fauna. Data collected by Lehtinen & Galatowitsch indicates that colonization of restored wetlands by amphibians is often rapid, yet it is constrained by the landscape context in which wetlands are restored. They concluded that spatial isolation and habitat suitability are key to the success of wetland restoration projects for pond breeding amphibians (Lehtinen & Galatowitsch 2000).

Knutson and others concluded that small, constructed farm ponds, properly managed, may help sustain amphibian populations in landscapes where natural wetland habitat is rare. They found small agricultural ponds in southeastern Minnesota typically provided breeding habitat for at least 10 species of amphibians and numerous birds and mammals. They further concluded that the small ponds providing the most species richness were ponds that exhibited sparse vegetation, low concentrations of nitrogen (limited access to livestock), and no fish (Knutson et al 2004). Furthermore, creating habitat for reptiles and amphibians associated with wetlands will benefit countless other wildlife as well. Wetlands support a variety of plants and habitat for many bird species and invertebrates such as dragonflies.

Management Objectives:

Because of the double lives they live amphibians require both suitable aquatic and terrestrial habitat. Their eggs are laid in water and they develop there making good water quality particularly important to their survival. Outside the breeding season adults and juveniles spend much of their time on land, where they need humid conditions to prevent water loss. Spring and fall migrations to and from breeding or wintering habitats is the highest potential for mortality due to site management.

The following are habitat management objectives to maintain self-sustaining populations of amphibians:

1. Creating ponds for egg laying

- Ephemeral ponds holding water for at least four months and less than 30 inches deep.
- Permanent water areas created from hillside seeps and shallow back water areas.
- Add "fingers" to both ephemeral and permanent water edges to increase shoreline length and diversity.
- Varying the topography within the pond will also increase diversity in temperatures and vegetation. Creating pockets of greater than 30 inches deep will create areas that won't freeze solid.
- All ponds should have gradual slopes.
- If more than one pond is constructed, vary the distance to the stream.
- Isolate ponds from unwanted sources of pollution such as runoff from roads.
- Additional habitat for salamanders would include downed woody debris adjacent to ponds.

2. Cover objects

- Small islands of rocks about 3 to 4 feet from the edge of the pond as a resting spots for frogs and dragonflies.
- Logs and rocks placed in the water, the edge of ponds and scattered along travel corridors provide ground basking platforms and shelter from the midday sun. Logs and rocks will also concentrate invertebrates and become important feeding areas for insectivorous herps.

3. Planting grasses

Planting grasses around ponds will provide foraging areas with sufficient populations of prey species. Wide buffer strips will also improve water quality and provide safe post-breeding habitat. However, dense tall grass stands are unsuitable for most herps due to impedance of movement and a lack of suitable basking habitat. By increasing the forbs and short-grass components of the seeding mix you will create interstitial spaces more conductive to herps movement and basking.

4. Access

Limit, or ideally, avoid access to ponds by livestock. Intensive wading disturbs vegetation and increases turbidity and nitrogen levels.

5. Oxbows

Connecting and even enlarging old oxbows and connecting them to the stream will support tadpoles, frogs and forge fish. An oxbow lake is a U-shaped lake water body formed when a wide meander from the mainstem of a river is cut off to create a lake. Coldwater predators will avoid these refuge areas because of the higher temperatures created in these shallow oxbows.

"Logs and rocks placed in the water... provide ground basking platforms and shelter from the midday sun."

Streams with rocks and log habitat: *Bad Axe River, Vernon County*

Basking Log & Turtle Resting Area: *West Fork, Wisconsin.*

6. Basking and sunning sites

Rock piles and fallen logs located within the pond can provide basking and sunning sites for amphibians and turtles, egg-laying sites for frogs and salamanders, and perches for birds.

- Basking logs should be placed at least 5 ft. from shore to avoid access by predators.
- Bury logs 5 to 8 ft. long, and an average of 6 to 10 inches in diameter.
- Using logs that have been dead for at least one year is preferred. Green logs are heavy and tend to sink.

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7. Hibernation

In general hibernation in the Midwest for herpetofauna is from mid-October through March.

- Ponds with at least one section 4 to 6 feet deep will prevent freezing all the way to the bottom.
- Excavating holes a minimum of 40 inches deep by 40 inches or more wide and filling with sand will provide additional habitat for toads. Covering the hole with cover can provide additional protection from freezing temperatures.
- Creating vortex weirs to create permanent pools. A "vortex weir", constructed by placing large rocks in the shape of a "V", with the point of the "V" pointed upstream with large boulders in the pool will also provide microhabitats for over wintering. As water flows over the rock it is directed to the center of the stream and the action of the water falling over the rock scours out a deep pool below.

Bishops Branch: *Vernon County, WI.*

"Large boulders in the pool will also provide microhabitats for over wintering."

Duck Egg: *Vernon County, Wisconsin.*

Amphibians projects were aimed at creating shallow back water areas. Coldwater predators will avoid these refuge areas because of the higher temperatures created in these shallow oxbows.

Creating side channels that connect to the stream but are slightly warmer in temperature will also provide additional refuge for frogs and forage fish.

"Wisconsin's only endangered amphibian the Blanchard's Cricket Frog."

Duck Egg: *Created by LaCrosse DNR Fisheries Crew, Vernon County, WI .*

Eastern Gray Tree Frog

Gordon Creek: *Designed by Joe Schmelz, Conservation Technician, NRCS Iowa County.*

Constructing point bars allows for the deposition of sediment and creates shallow flats. These shallow gradient mud or sand flats below the eddies which typically support low and sparse vegetation are ideal for a number of frogs, but are particularly ideal for Wisconsin's only endangered amphibian the Blanchard's Cricket Frog.

Emergent wetland, sedge, and wet meadow habitats with 50-80% vegetative cover offer optimal shelter, food, foraging habitat, and egg attachment sites for most herps; whereas, wetlands with sparse plant, algal, and periphyton communities house minimal food resources for tadpoles and turtles with herbaceous diets (IA NRCS Restoring and Managing Habitat for Reptiles and Amphibians). ■

Notes:

reptiles

Reptiles *(class reptilia),* such as turtles, snakes and lizards are air-breathing and cold-blooded with skin covered in scales as opposed to hair and feathers. Both reptiles and amphibians are often referred to as cold-blooded, but in fact do not have cold blood. They are incapable of maintaining a consistent body temperature on their own and rely on basking in the sun if they are too cold or seeking shade if they are too hot. This is especially true with reptiles that rely strongly on their environment for thermoregulation.

"air breathing and cold-blooded with skin covered in scales"

Turtles

Threats: Like amphibians, reptiles face a number of threats from pollution, invasive species, exploitation, and to their number one threat, loss of habitat. Wisconsin, like other states, has lost over half of its wetlands since European settlement. The value of restored habitat areas decreases as they become more isolated. Fragmentation of habitat leads to smaller population sizes and small populations are more vulnerable to genetic challenges such as inbreeding and dramatic environmental events or changes (Habitat Management Guidelines for Amphibians and Reptiles of the Midwest. 2002).

Management Objectives: Three of the five turtles identified as potentially being detectable in the Driftless Area are primarily aquatic, even though all turtles lay their eggs on land. The Blanding's turtle and wood turtle are semi-terrestrial, dividing their time on both land and water. All five species of turtles spend a great deal of time under water by taking water into their mouth and cloaca (the termination of the urinary and digestive systems). Here, the skin lining the throat and cloaca is capable of exchanging enough oxygen and carbon dioxide to sustain the low metabolism (Premo 2005).

To protect themselves from freezing, several of the species bury themselves in the substrate while others simply lie on top of the substrate and remain fairly immobile during the winter. Several radio-tracking surveys have shown that many turtles do not actually hibernate, but instead remain semi-active, moving about during the winter. Two of Wisconsin's threatened turtles the Wood turtle and Blanding's turtle have been observed mating under ice (Christoffel et al. 2002).

Habitat practices described earlier for amphibians will also benefit reptiles. For example, turtles not only feed in ponds, but will also spend time basking on logs or hiding in pond vegetation and mud. However

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we have developed some additional in-stream habitat practices for turtles:

1. Hibernaculum for Turtles:
The structure used for creating over wintering habitat for dormant animals is called hibernacula. Even though many turtles remain active throughout winter, many find refuge in fine silts. Silts are often deposited on the downstream side of trees that have lodged adjacent to the streambank. The large trunk or roots of a tree slow the water down and allow silt to settle and accumulate. Turtles locate these deposited fine silts and bury themselves in the fall. Unfortunately, some of the worst streambank erosion occurs adjacent to these unstable tree roots, and as discussed earlier, an unanchored tree is good habitat one year and often gone the next year with the spring floods. In order to create permanent over wintering habitat the conservation practice needed to create pockets of fine silt should be placed where no erosion will occur, and should be a permanent structure.

Conservationists working with Robert "Bob" Hay, Wisconsin Department of Natural Resources Conservation Biologist designed a wooden structure to be placed under water on the downstream inside of the bend where it would accumulate fine silts. The turtle hibernacula, made of a hard wood, will be virtually rot resistant once it is placed under water and not exposed to air.
Our current design uses two inch thick rough oak, eight feet long, which is what we typically use for building our habitat structures for trout.

During the placement of turtle hibernacula a large rock is placed on top of the structure which helps to hold the structure under water while it is buried.

Gordon Creek: *Designed by Joe Schmelz, Conservation Technician, NRCS Iowa County.*

2. Vortex weirs with boulders or woody debris: The vortex weir can also be used to create permanent pools for turtles that spend a great deal of time under water during the winter. As with amphibians this practice originally designed for trout to create a deep pools also benefit turtles. Large boulders or woody debris placed below the weirs create pockets of slack water and reduce the amount of energy needed by trout and turtles to feed.

Vortex weirs are often created by utilizing rocks, however in smaller streams wood can be used as well. (see standard design)

"originally designed for trout to create deep pools also benefit turtles."

3. Cross channel logs: Cross channel logs can also be used to create deep pools. Care must be taken to keep water from undermining the log and losing the plunging effect. Packing rock of different size on the upstream side of the log will help reduce the chance of undermining and create additional microhabitat.

4. Basking logs: Walk any stream or pond and you can often find turtles basking on logs. Basking helps turtles regulate their body temperature and aids in digestion. Vitamin D is important for the uptake of calcium from their food and promotes shell development in the younger turtles. Basking in the sun not only helps regulate their body temperature, but the warmth of the sun allows the shell to dry, inhibiting bacterial and fungal growth (Christoffel et al. 2002). Creating permanent basking logs, or escape logs, is a simple task with an excavator. Logs can be anchored into the bank and placed just off the surface of the water where they would not obstruct water flow and allow turtles to escape predators by sliding off into a deep pool.

5. Cover rocks: Another practice often used to create additional habitat for trout is placing large boulders in deep water on straight stretches of stream. The eddies behind the large boulders in the center of the channel will also provide microhabitats for over wintering turtles.

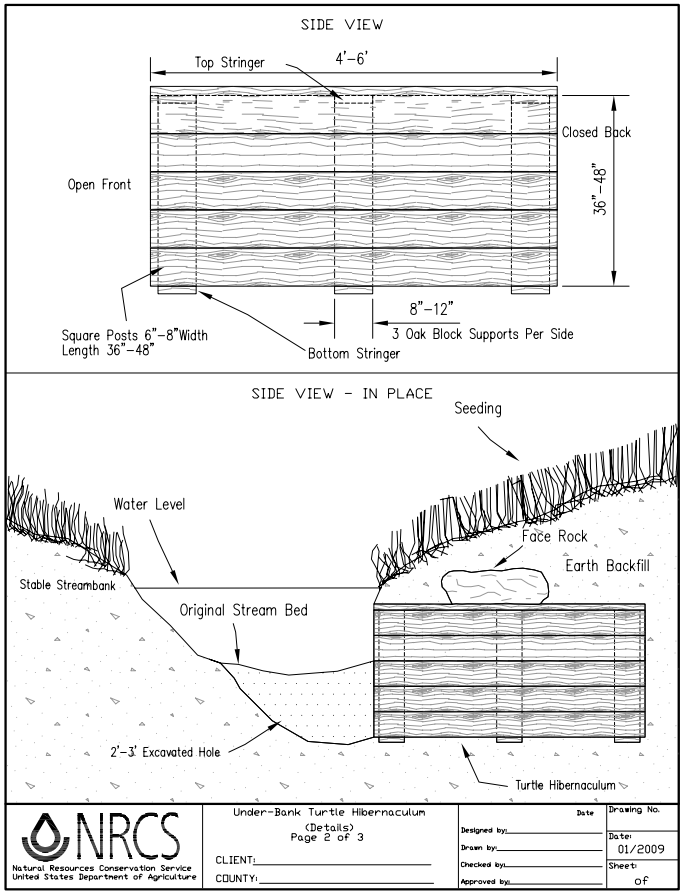
6. Rock deflectors: Rock deflectors typically installed to kick water flow from one bank to the other in time will also provide shallow flats on the downstream side. (For details see standard designs on next page)

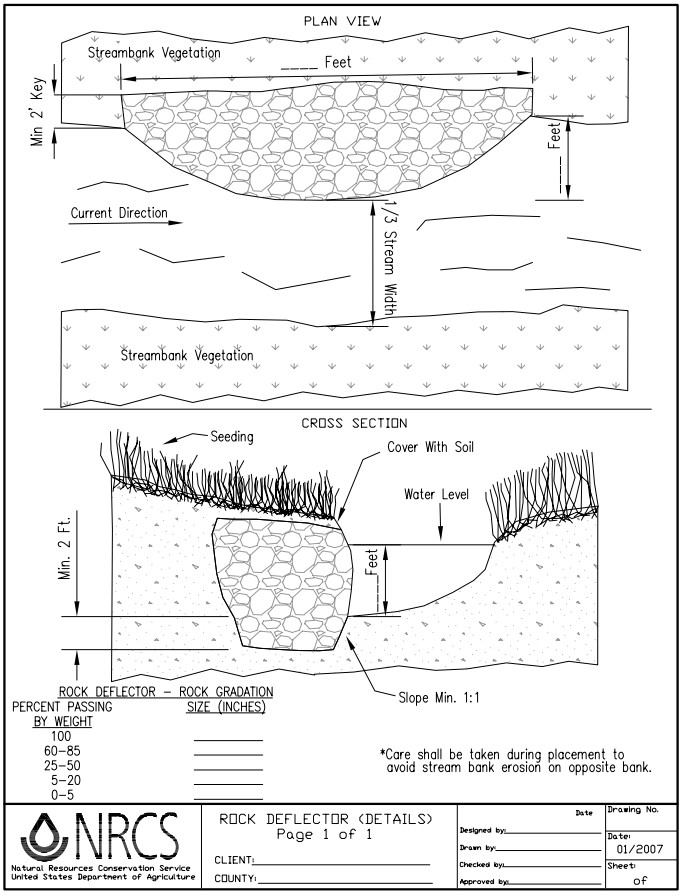
7. Brush bundles: Brush bundles located below rock deflectors will accumulate silt over time, providing additional habitat for turtles and overhanging branches for water snakes.

"Overtime a rock deflector will create a mud flat."

"creating permanent basking logs, or escape logs, is a simple task with an excavator."

Standard Habitat Designs for use with reptiles and amphibians. See Turtle Hibernacula Diagrams pages 17-18 at end of guide.





Word Turtle: *Hatching in sand.*

Spiny Softshell Turtles:
Spend extended periods of time under water.

Snakes

Threats: Snakes play very important roles in many natural communities as predator and prey. Smaller snakes provide a valuable food source for small mammal and birds. They also consume large quantities of insects and small vertebrates. Medium-sized snakes are fed on heavily by birds of prey, especially by hawks. The medium and large snakes are particularly important in our ecosystems for their rodent control. Recent studies suggest that snakes are also valuable in reducing disease threats (hanta virus, Lyme's disease) posed by high rodent populations (Christoffel et al. 2002).

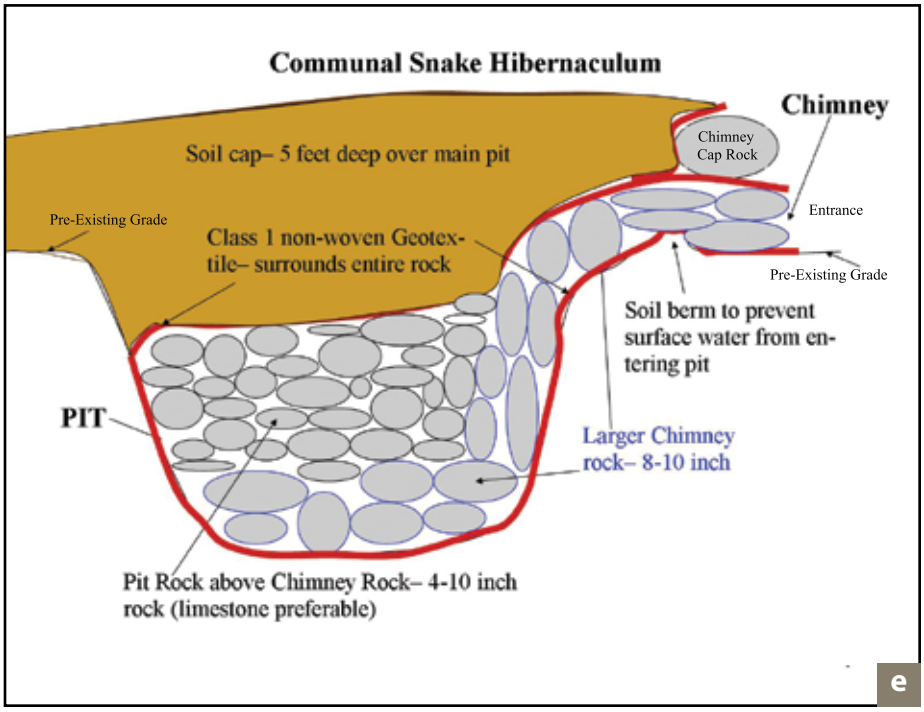
Snake populations have declined in the Midwest due to habitat loss and human persecutions. Even today, people who do not understand or appreciate the value of snakes continue to needlessly kill them.

Management Objectives: Snakes require a readily available supply of underwater plants, fish, insects, and tadpoles upon which to feed, and substantial terrestrial and aquatic cover. Although not dependent on ephemeral wetlands, snakes such as the Garter Snakes and Water Snakes will forage on the abundant prey found in these wetlands. Providing nesting habitat can easily be accomplished by providing piles of compost or woodchips. As with the other amphibians and reptiles, snakes are dependent on outside sources of heat to warm their bodies. A pile of rocks up to 12 inches high is a great place for them to soak up some heat. Lack of prairie habitat has also been sited as one of the greatest barriers to maintaining and recovering snake populations.

"snakes require a readily available supply of underwater plants, fish, insects and tadpoles upon which to feed."

Hibernacula for Snakes: In the winter, snakes hibernate and are incapable of long migrations and therefore must find suitable hibernaculums in the vicinity of their summer haunts. Some snakes, like turtles, also over winter underwater. The Eastern Milk Snake, the Western Fox snake, and the common garter snake all must find a suitable hibernaculum in the vicinity of their summer habitat. They require a secure den with low temperatures that remain above freezing. Since they are susceptible to loss of body water, their hibernation site must also be close to the water table (but not flooded). A number of studies have shown the lack of adequate hibernacula is a limiting factor in the success of snake populations (Christoffel et al. 2002).

For a detailed drawing see page 15 in the "Standard Habitat Designs" section.



Diagram/Design by ***Robert Hay***

"Lack of adequate hibernaculum is a limiting factor in snake population."

Common Snake Hibernaculum Specifications *Robert Hay*

1. Pit placement – Must be placed outside the 100-year floodplain in uplands where the water table is 5 to 7 feet below the existing ground surface during late summer or fall. Place on flat or south facing slopes.

2. The excavated pit must be slightly wider at the top than it is deep in one dimension to keep it defined as a pond rather than a well – Wisconsin DNR Regulation.

3. The pit should be excavated to a depth of 1 to 2 feet below the normal late summer or fall water table.

4. Pit width should not exceed 40 inches, 30 to 36 inches is preferred.

5. Line pit and full chimney with heavy Class 1 non-woven geotextile fabric with enough extra material to allow all of the rock to be enclosed by it after the rock has been placed in the pit and chimney.

6. Add a mix of 4 to10 inches of rock on top of this larger rock until the total rock depth in the pit is about 4 to 5 feet in depth.

7. Fill the bottom and chimney of the pit with two layers of 8 to 10 inches of rock. This allows for entry by larger snakes. The chimney ends about 3 feet beyond the top edge of the pit.

8. Periodically sprinkle in shovels of damp soil as rock is added. Do this sparingly to avoid filling in voids between the rocks. The soil holds valuable moisture that is essential to hibernating snakes.

9. Wrap the rocks completely with the fabric, including over the entire chimney except for the entrance itself.

10. Place large rocks directly above the chimney entrance on top of the fabric.

11. Cover the rocks (the side closest to the pit) with an additional piece of fabric. These rocks serve to prevent the soil cap over the chimney from sloughing over the entrance to the chimney.

12. Place soils over the fabric, including the chimney. The soils should be a minimum of 5 feet deep over the pit and 1 to 2 feet deep over the chimney, except right up against the rock above the chimney entrance.

13.Create a six-inch berm of soil across the width of the chimney entrance (where snakes enter the hibernaculum).

14. Seed and mulch the entire cap with a perennial grass mix.

Additional rocks placed on the south facing side of the hibernacula would serve as basking areas.

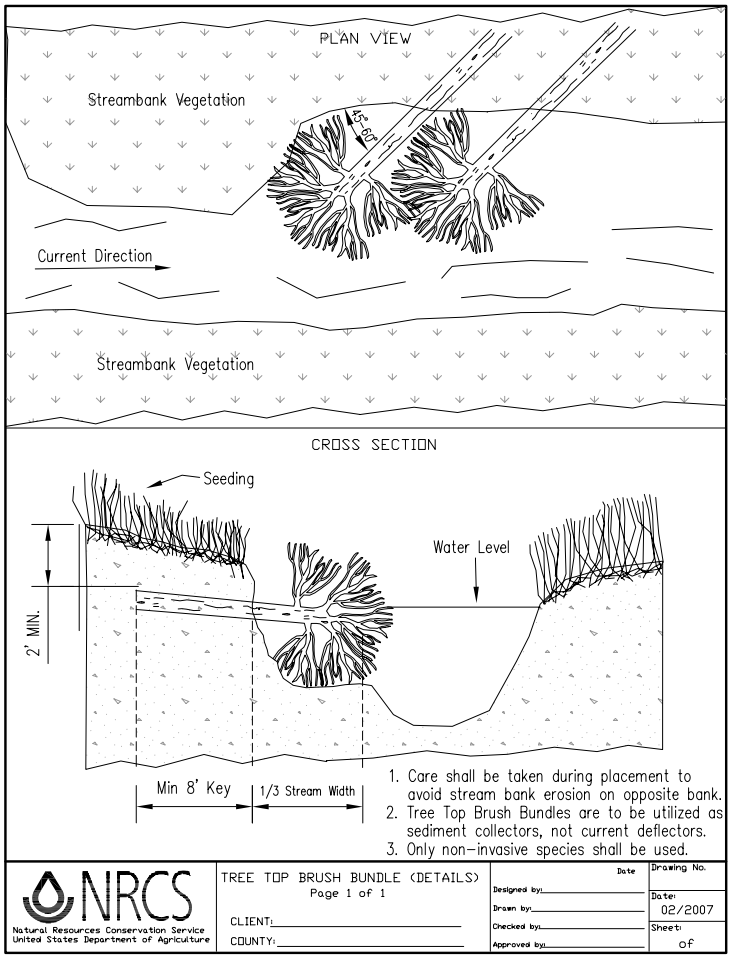
"We were able to construct a hibernacula as part of a streambank stabilization project for less than $1,000."

Snake Hibernaculum: *Paul Krahn, Vernon County technician designed the hiberncula into the streambank project.*

Constructing a hibernaculum for snakes is not an uncommon practice. The first hibernaculum of the Bishop Branch project was created as described on the previous page. What was unusual about our second hibernaculum was that it was placed in conjunction with the bank stabilization project. Shaping the bank and anchoring the toe of the bank with rock is standard operating procedure when installing rock rip-rap. But, by placing 6 to 12 inches of clean rock two feet under water, running the rock up the slope, wrapping the rock in a fabric and providing an entrance to the rock we were able to construct a hibernacula as part of the streambank stabilization project for less than $1,000.

PVC pipes were installed so that water temperature could be monitored in the in-stream hibernaculum and another hibernaculum every hour, twenty-four hours a day, seven days a week for a year. The temperature of the water in both hibernacula never reached freezing and rapid fluctuations were never observed.

Sloughing of the banks was a common problem of the hibernaculum next to the stream during construction, however it was concluded that by constructing the trench in phases, instead of opening it all at once would have helped to reduce the collapsing sides of the hibernacula.



Standard Habitat Designs for use with water snakes.

See Tree Top Brush Bundle Diagrams page 15 at end of guide.

Snakes may travel as far as a mile to use a hibernaculum. Given some time one hibernaculum could support as many as 80 to 100 fox snakes, and 600 to 700 garters snakes.

Northern water snakes forage along stream and river banks. Providing in-stream habitat such as tree top brush bundles could provide essential habitat. ■

birds

Birds *(class aves)*

Stream projects for bank stabilization and trout are sometimes at odds with the needs of a variety of birds. Removing the trees lining the streambank that once provided nesting habitat and the shaping of eroding vertical banks can destroy nesting bank swallows. Hanging netting over the bank in early spring where swallows have nested in the past can discourage or prohibit swallows from starting to nest. Also, replacing trees and cool season grasses that existed prior to construction with warm season grasses will benefit a number of bird species.

"muddy shorelines provide important resting areas during migration."

Spieces: *Solitary Sandpiper on migration utilizes mud flats to feed on small crustaceans.*

If stream restoration specialists are knowledgeable about the various birds in the area they can even add additional habitat that didn't exist before. For example, the Louisiana Waterthrush (Seiurus motacilla), utilizes rocks in riffles to access aquatic insects. Feeding boulders could be placed with minimal cost and effort during the construction process where appropriate.

Ponds and oxbows also create valuable habitat for shorebirds. They feed on invertebrates that can be found in the mud or in very shallow waters. These muddy shorelines also provide important resting and feeding areas during migrations. ■

La Crosse Fisheries: *Duck Egg Property, Vernon County, Wisconsin*

a

Notes:

monitoring

Monitoring

The Wild & Rare Committee agreed to the following procedures for monitoring amphibians and reptiles in the Driftless Area. We strongly encourage you to monitor your projects to determine if you are increasing populations and diversity of species utilizing your project.

Outcomes of Discussion on Riparian Corridor Restoration Project Monitoring for Amphibians and Reptiles

October, 28, 2008

***Goal:** To determine responses of amphibians and reptiles to riparian habitat improvements associated with ecologically-balanced stream restoration efforts.*

Measurable Objectives:

- Presence/Absence
- Age class representation
- Evidence of onsite reproduction
- Successful recruitment
- Habitat comparisons (pre vs. post)

"Our goal is to determine responses of amphibians and reptiles to riparian habitat improvements associated with ecologically-balanced stream restoration efforts"

Approach:

Monitoring Area

Clearly identify monitoring area (length and width of riparian corridor). GPS and flag upstream and downstream limits and lateral perimeters.

Discussion on this topic resulted in a decision that the monitoring area would match the area that will be directly affected by the restoration. Many stream restoration projects have a 66-foot wide setback from the stream on both sides. Other projects may affect a much broader riparian and upland area. All of the area and habitats within the restoration area will be included in the monitoring effort.

Pre-existing habitat and projected post-project habitat will be used to determine where to monitor. To the extent possible, monitoring activities should occur in the same locations.

Year 1 - Conduct a thorough habitat assessment prior to or during pre-monitoring activities to identify all habitat types, land use within the restoration area and land use immediately adjacent to the restoration area, and the percent of each habitat type within the restoration area.

Conduct pre-restoration inventories to acquire a reasonable baseline for herptiles (presence and relative abundance) for comparisons with post-restoration inventories.

Since the monitoring efforts would end by mid-July (see monitoring phenology calendar below), there would be enough time to obtain the pre-project inventories and still allow the restoration project to occur in the same year. For projects that will have to begin restoration work prior to mid-July, pre-restoration inventories will need to occur one season before restoration begins. (e.g. If restoration is to begin in June 2010, pre-restoration inventories need to occur in 2009.)

Year 1 or 2
Conduct restoration/enhancement.

Years 2 & 4 or Years 3 & 5
Conduct follow-up monitoring. Conduct monitoring annually unless funding limited this opportunity. Long-term monitoring was also suggested for some sites to evaluate the longer-term affects of the restorations. This may occur as funding permits.

Survey Methods:

Amphibians

Auditory anuran calling surveys.

Salamander funnel trap surveys.

Time/Area-constrained searches- (visual encounter surveys, dip netting, hand collection, etc.).

Reptiles

Hoop net trapping in riparian wetlands and in stream.

Cover Board Sampling.

Time/Area-constrained searches.

Drift fences.

Survey Effort:
Conduct identical pre and post-restoration inventories.

Amphibians

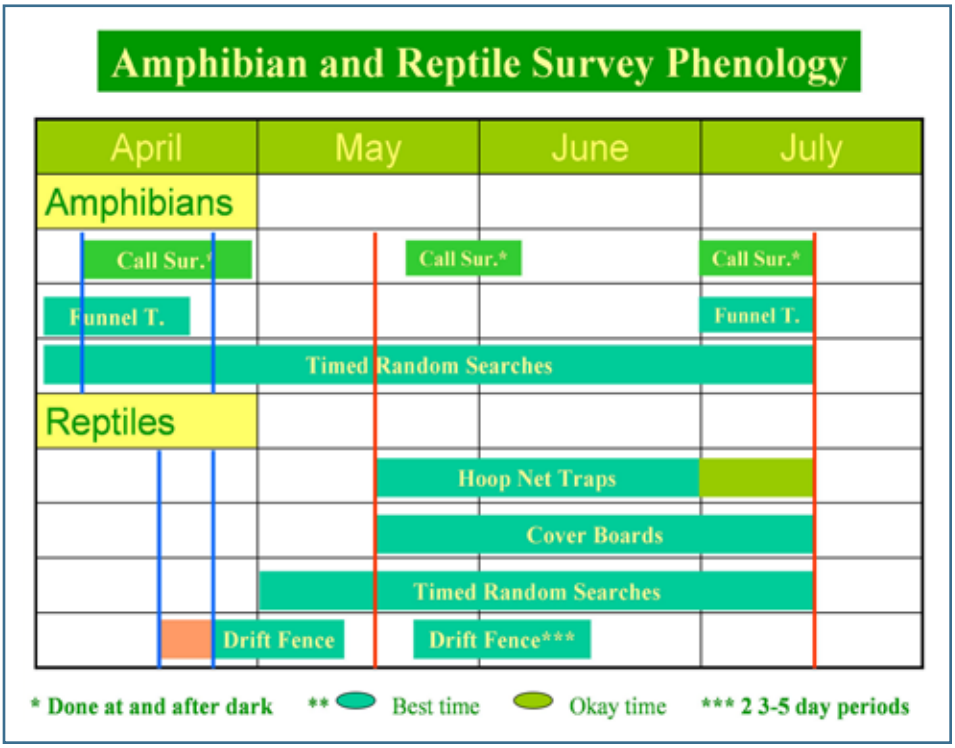
- Calling Surveys- 2 surveys/3 calling phonologies* (April 8-30; May 20-June 6; July 1-15).
- Funnel Trapping- use five traps per riparian wetland for five days twice/yr, (April 1-20 and July 1-15) - Check daily.
- Time-constrained searches- during suitable conditions (10-1.5 hrs periods- conduct on days of other surveys when conditions permit).

* Restoration sites longer than .5 miles will need more than one listening point. Listening points much be a minimum of .5 miles apart.

Reptiles

- Hoop Net Trapping- in riparian wetlands and stream- 8 trap days from May 15-June 30-1 to 2 traps per wetland depending on size (6 traps per site).
- Cover Board Sampling - 10 days with 3 boards per 100 meters of stream sampled. Placement adjacent to stream and wetlands on dry ground- May 15-July 15.
- Time-constrained searches- during suitable conditions (10-1.5 hrs periods- conduct on days of other surveys when conditions permit).
- Drift Fencing - Two Y-shaped arrays (3- 15M legs) per site using funnel and pitfall traps. Arrays should be placed in similar locations each year. Arrays should be run three times per year, for 3-5 days each, targeting rain and post-rain periods. Check traps every 24 hours.

All surveys shall be conducted such that they will be consistent among years (methods, area and effort).



Example Budget:

Budget: per monitoring year

Amphibians

Mileage - 13 trips at 100 mi/trip @ .46/mi	=	$ 598
Equipment - 10 traps/site @ $24/trap	=	$ 240
Labor - F&T, funnel trap and timed surveys	=	$ 693
	Sub-total	$1,531

Reptiles

Mileage - 16 trips at 100 mi/trip @ .46/mi	=	$ 736
Equipment - 6 hoops, 30 cover bds., drift fence	=	$1,600
Labor - Hoop traps, cover boards, drift fence	=	$ 715
	Sub-total	$3,051

Herptile Monitoring Budget (3 years):

Year 1 expenses	=	$4,582
3 years monitoring effort (1 pre & 2 post)	=	$11,066 *

**Years 2 & 3 do not include original equipment costs but includes $500/year for equipment replacement*

Nongame Fish

Electro-shocking surveys

Other Taxa Survey Efforts:

Macro-Invertebrates

- Kick-netting in-stream- done in every microhabitat identified, stratified by sampling area based on its availability in relation to others in the stream stretch
- Funnel trapping- done while sampling amphibians
- Sediment sampling

Budget:

Macro-invertebrates

Kick netting - 5 hrs/sample	=	$ 55
Sediment sampling - 3.5 hrs/sample	=	$ 39
Mileage - 320 mi. @ .46/mi	=	$ 147
• Sample ID and data entry *(UW-Stevens Point)*	=	$ 150
• Miscellaneous expenses	=	$ 130
	Sub-total per year	$ 521
	Three year monitoring effort	$1,563

Nongame Fish

Electro-fishing

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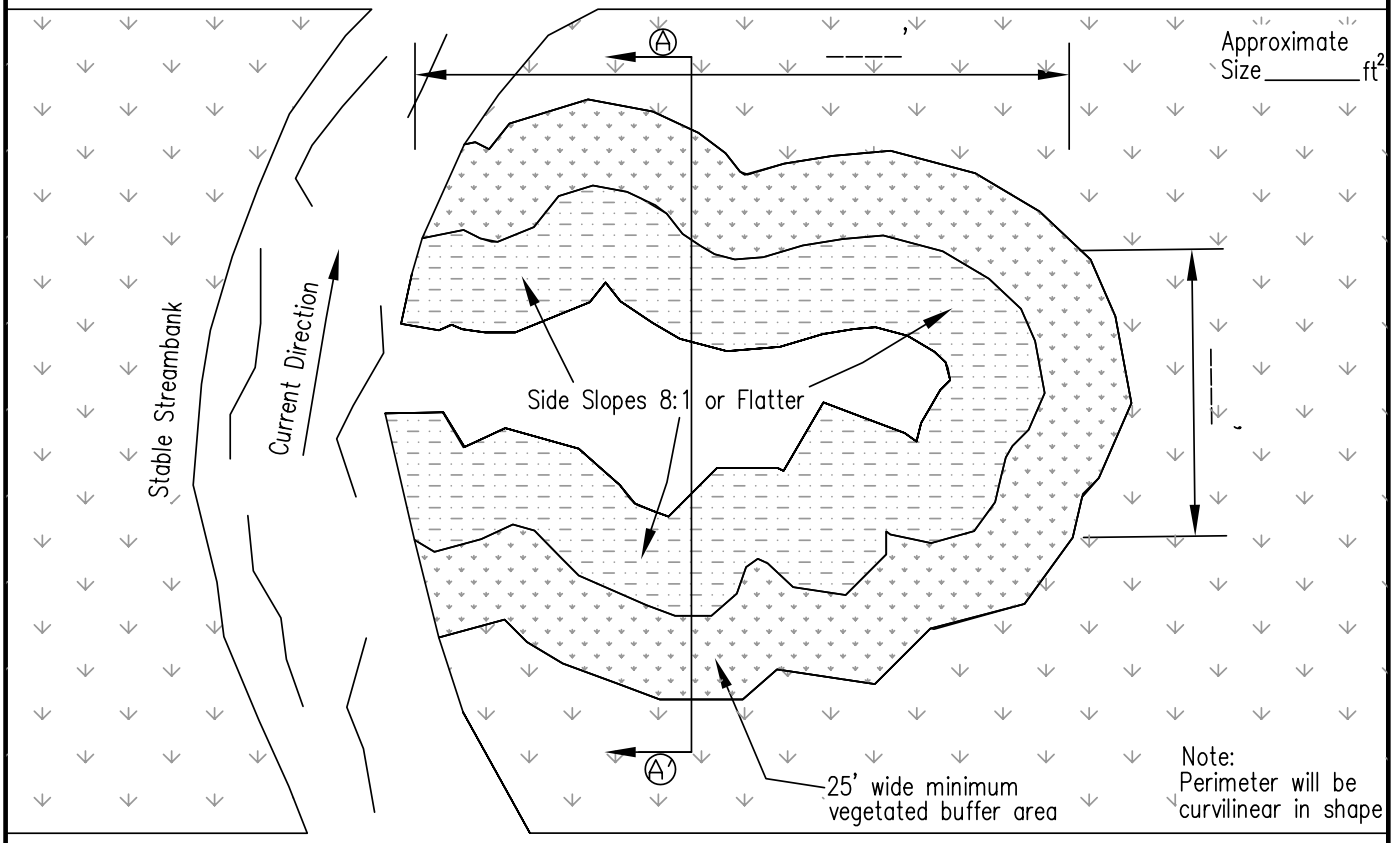
habitat designs

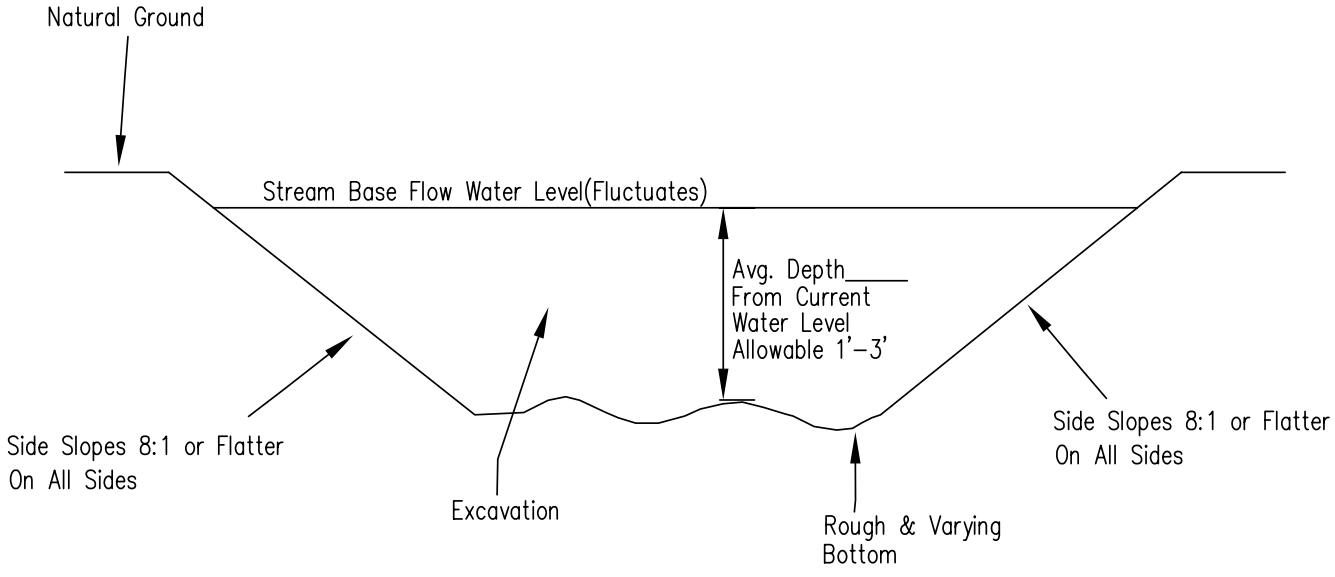
NRCS Standard Designs

Riparian Habitat Practices

EXAMPLE PLAN VIEW - IN PLACE



TYPICAL CROSS SECTION A-A'



NRCS Natural Resources Conservation Service United States Department of Agriculture	Backwater Wetland (Not to Scale) Page 1 of 2 CLIENT: _____ COUNTY: _____	Date Designed by: _____ Drawn by: _____ Checked by: _____ Approved by: _____	Drawing No. Date: 01/2009 Sheet: of

CONSTRUCTION NOTES FOR BACKWATER WETLANDS

1. BACKWATER WETLANDS ARE TO BE IRREGULAR IN SHAPE WHEN COMPLETED. WHEEL RUTS ARE ALLOWED AND DESIRED. THE WETLAND NEEDS TO BE CONSTRUCTED TO THE APPROXIMATE SURFACE AREA, DEPTH AND IRREGULARITY AS WHAT IS FLAGGED BY NRCS STAFF.

2. ALL EXCAVATION SHALL BE IN ACCORDANCE WITH WISCONSIN CONSTRUCTION SPECIFICATION #2.

3. RE-TOPSOILING MAY BE NEEDED. IF NEEDED A MINIMUM OF 6" OF TOPSOIL WILL BE REMOVED FROM WETLAND SITE AND STOCKPILED FOR RE-SPREADING. BEFORE TOPSOIL IS RE-SPREAD THE DEPTH AND SLOPES MUST BE CHECKED. SEEDING SHOULD BE COMPLETED PER DRAWING WI-710 FOR INTRODUCED SPECIES OR DRAWING WI-711 FOR NATIVE SPECIES.

4. THE FINSIHED SIDE SLOPES ARE TO BE 8:1 OR FLATTER.

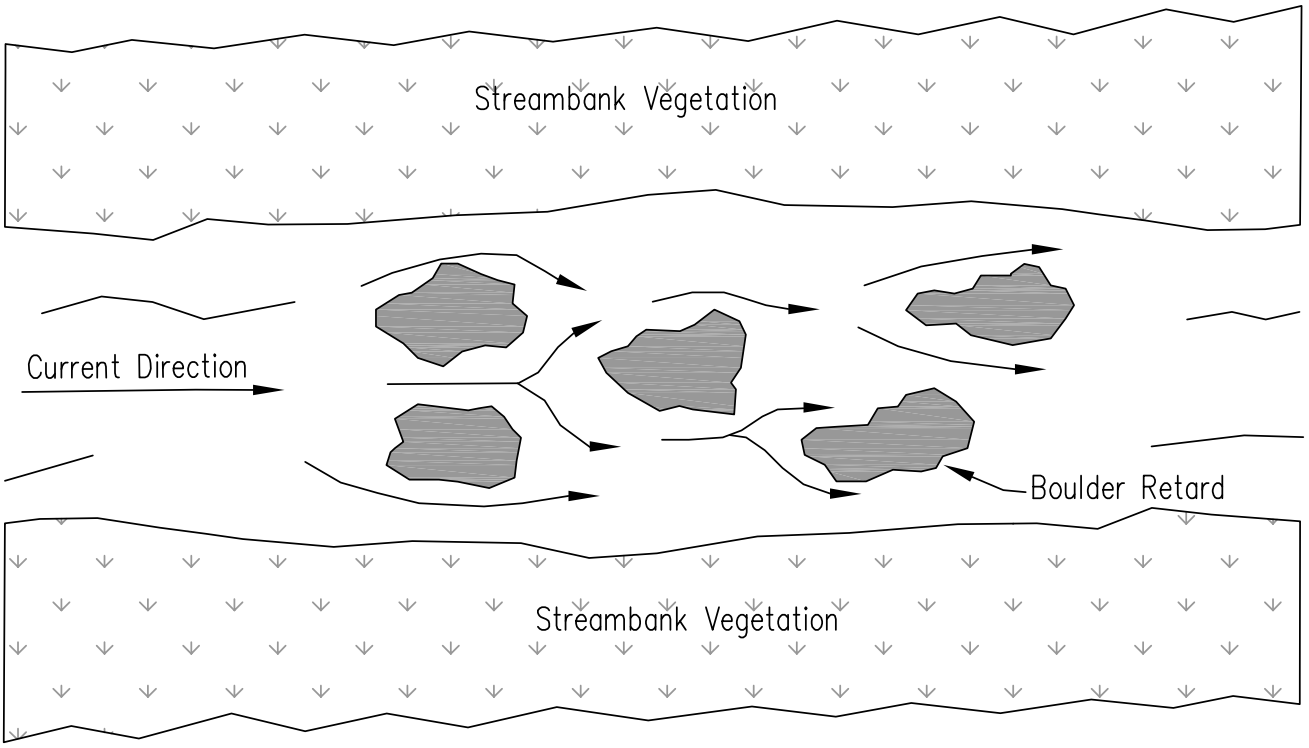
5. EXCAVATED SPOIL FROM THE SCRAPE SHALL BE:
   a. REMOVED FROM THE WETLAND/FLOODPLAIN AREAS AND PLACED AS INDICATED ON THE PLAN VIEW.
   b. PLACED BELOW THE PLANNED NORMAL WATER ELEVATION OF THE POOL FOR WETLAND MICROTOPOGRAPHY.
   c. SPREAD ABOVE THE PLANNED NORMAL WATER ELEVATION IN A LAYER AVERAGING NO MORE THAN 3-6 INCHES THICK. SPREAD IN THE LOCATIONS INDICATED ON THE PLAN VIEW FOR THIS PROJECT. NO FILL SHALL BE PLACED IN AN EXISTING WETLAND

6. BASKING AREAS MAY BE ADDED AS APPROVED BY NRCS STAFF. THESE AREAS CAN CONSIST OF LOGS/WOODY DEBRIS OR PILES OF STONE ADDED TO THE WETLAND. THESE ADDITIONS SHOULD BE PLACED A MINIMUM OF 3-4 FEET FROM THE EDGE OF THE WETLAND TO ACT AS A BASKING AREA AND BE FAR ENOUGH INTO WETLAND TO MINIMIZE PREDATION.

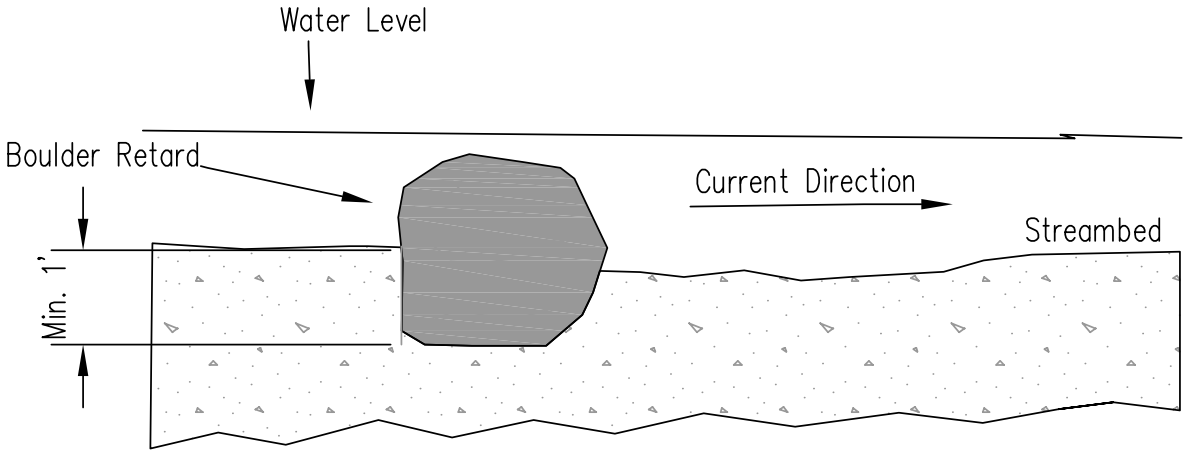
7. BUFFER SEED MIXES SHOULD BE STRONGER IN FORB AND SHORT GRASS COMPONENTS. THIS WILL CREATE MORE INTERSTITIAL SPACE, AIDING IN REPTILE/AMPIBIAN MOVEMENT AND BASKING PER WI-710 OR WI-711.

NRCS Natural Resources Conservation Service United States Department of Agriculture	Backwater Wetland (Not to Scale) Page 2 of 2 CLIENT: _____ COUNTY: _____	Date Designed by: _____ Drawn by: _____ Checked by: _____ Approved by: _____	Drawing No. Date: 01/2009 Sheet: of

PLAN VIEW



CROSS SECTION



*Average rock size– 1.5'–3.5' dia.–rock size is site dependent.

*A minimum of one boulder per set of boulder retards should protrude from water surface during times of ordinary flow to act as mid–stream perching/loafing sites.

*Use boulders with irregularities or mulitple boulders together to provide slight overhanging cover.

*Place boulder retard so current will not be deflected into unprotected stream banks.

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Natural Resources Conservation Service
United States Department of Agriculture

BOULDER RETARDS (DETAILS)
Page 1 of 1

CLIENT: _____

COUNTY: _____

Date

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Checked by: _____

Approved by: _____

Drawing No.

Date: 11/2007

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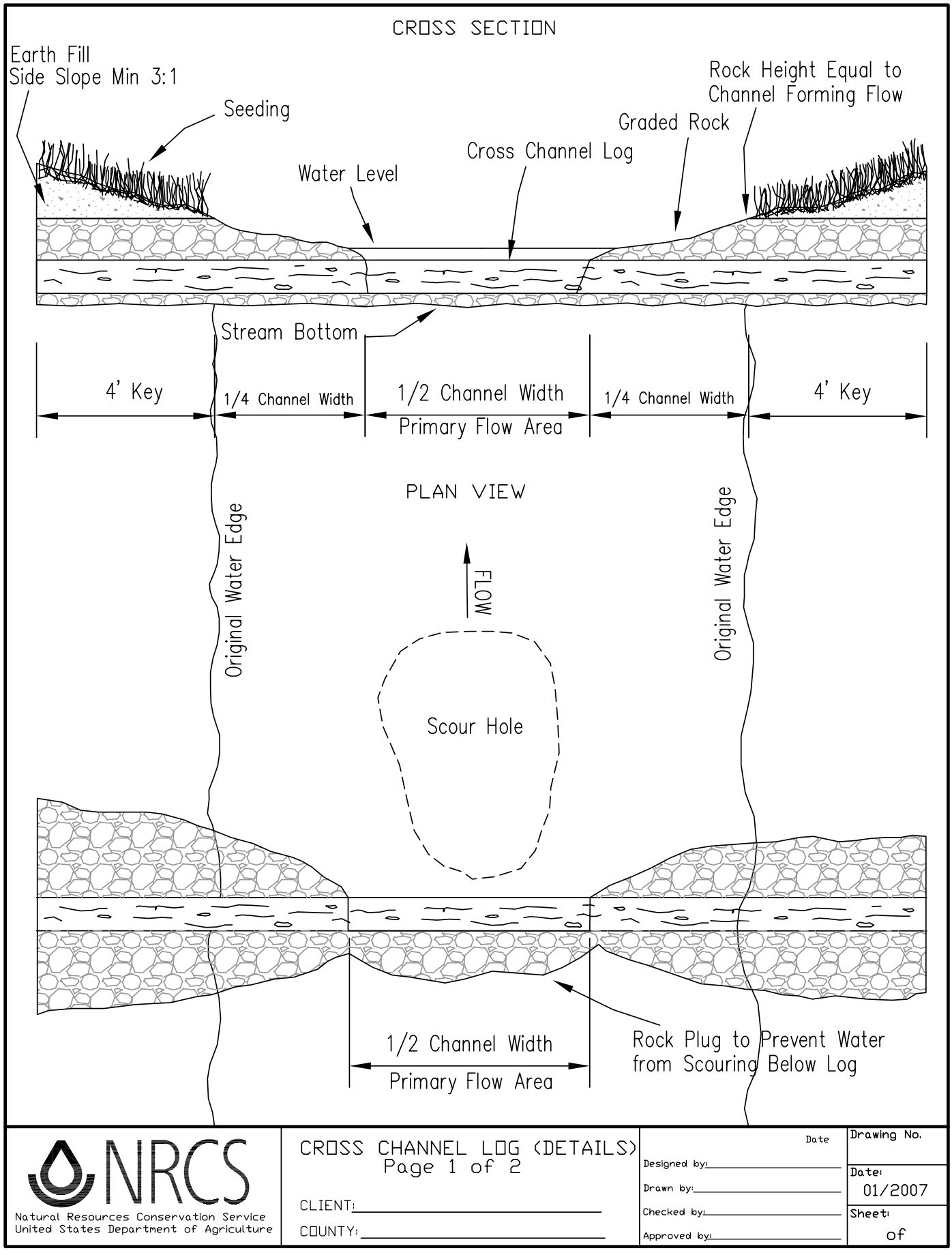

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CROSS CHANNEL LOG (DETAILS)
Page 1 of 2

CLIENT: _____

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Drawing No.

Date: 01/2007

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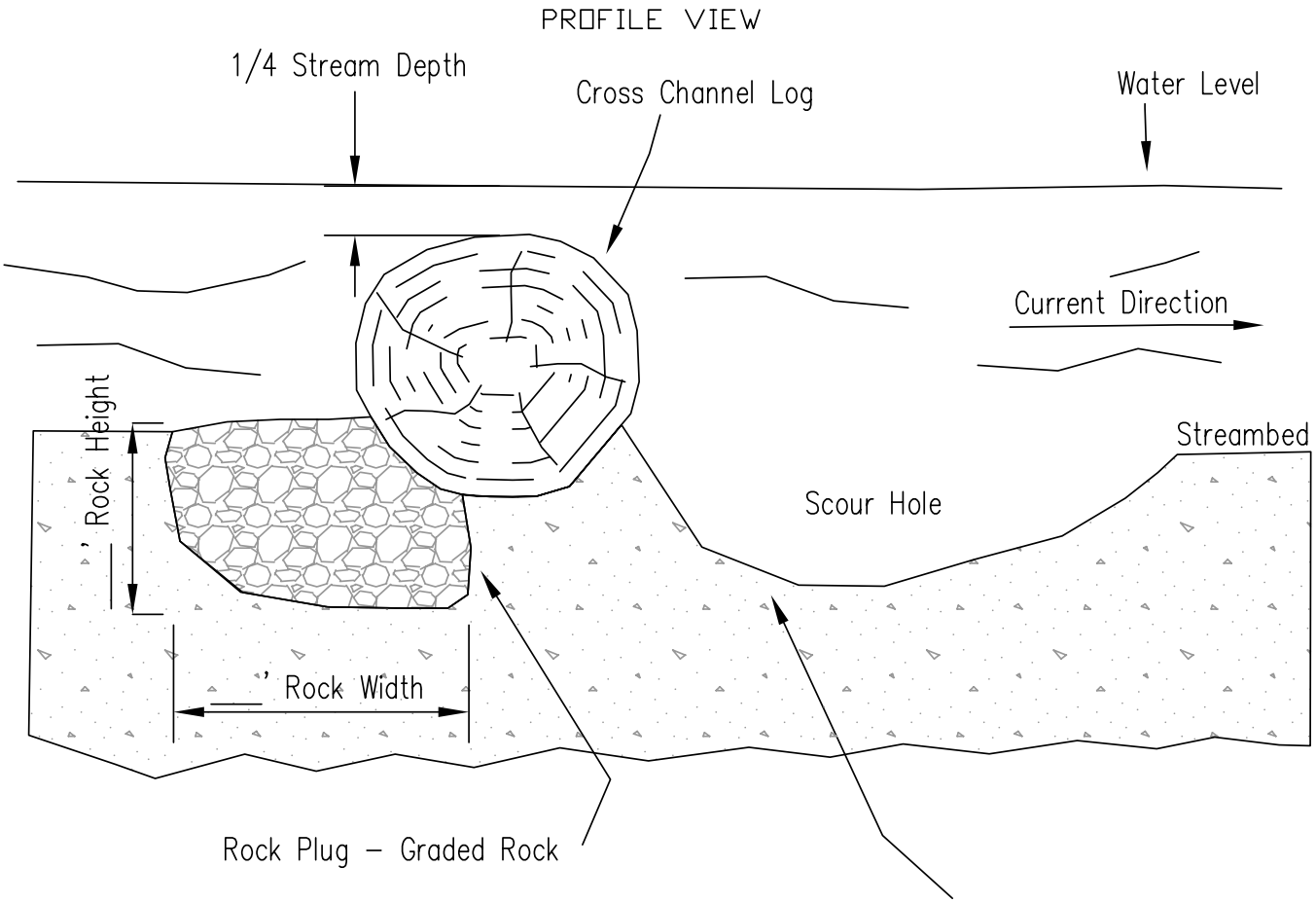

Rock Plug depth must be kept deeper than the anticipated depth of the Scour Hole.

DESIGNED
GRADATION OF ROCK
FOR PLUG AND ANCHORING ROCK

PERCENT PASSING BY WEIGHT	SIZE (INCHES)
100	_____
60–85	_____
25–50	_____
5–20	_____
0–5	_____

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United States Department of Agriculture

CROSS CHANNEL LOG (DETAILS)
Page 2 of 2

CLIENT: _____

COUNTY: _____

Date

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Checked by: _____

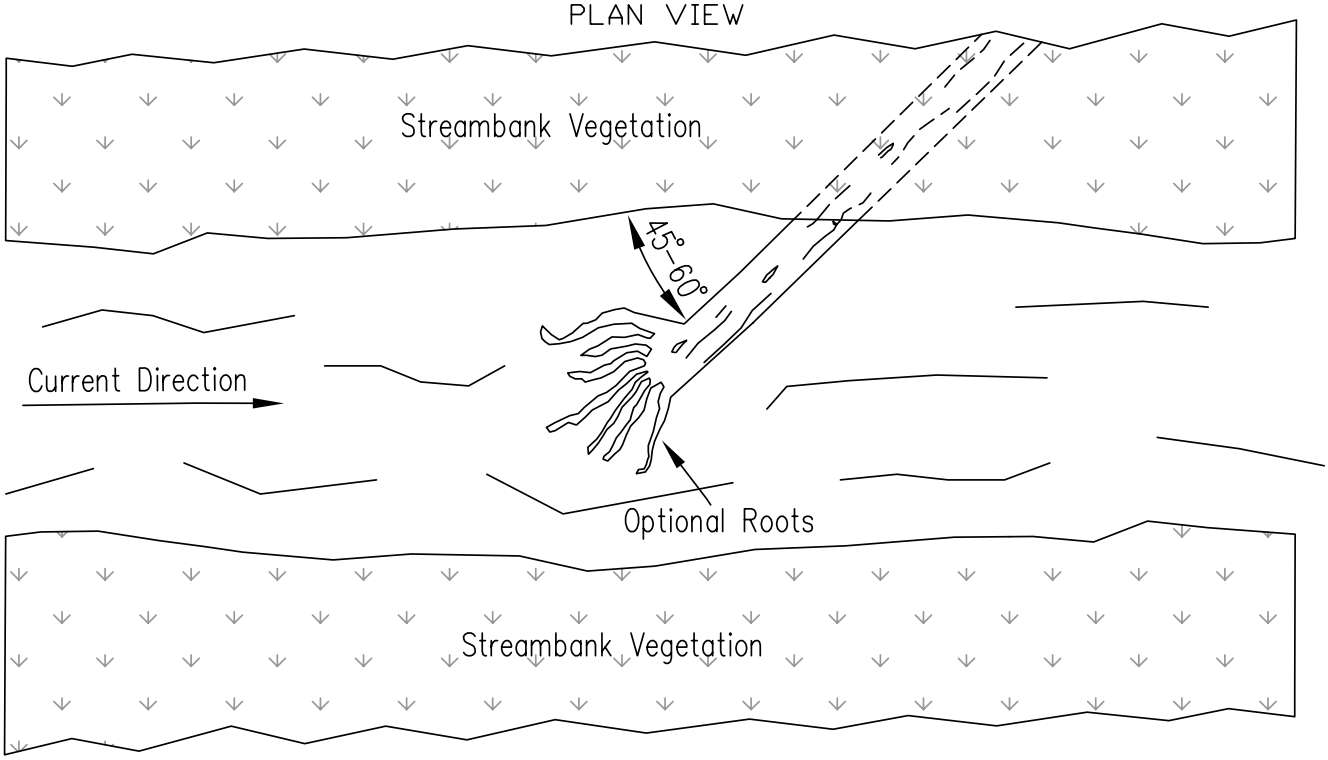
Approved by: _____

Drawing No.

Date: 01/2007

Sheet: of

PLAN VIEW



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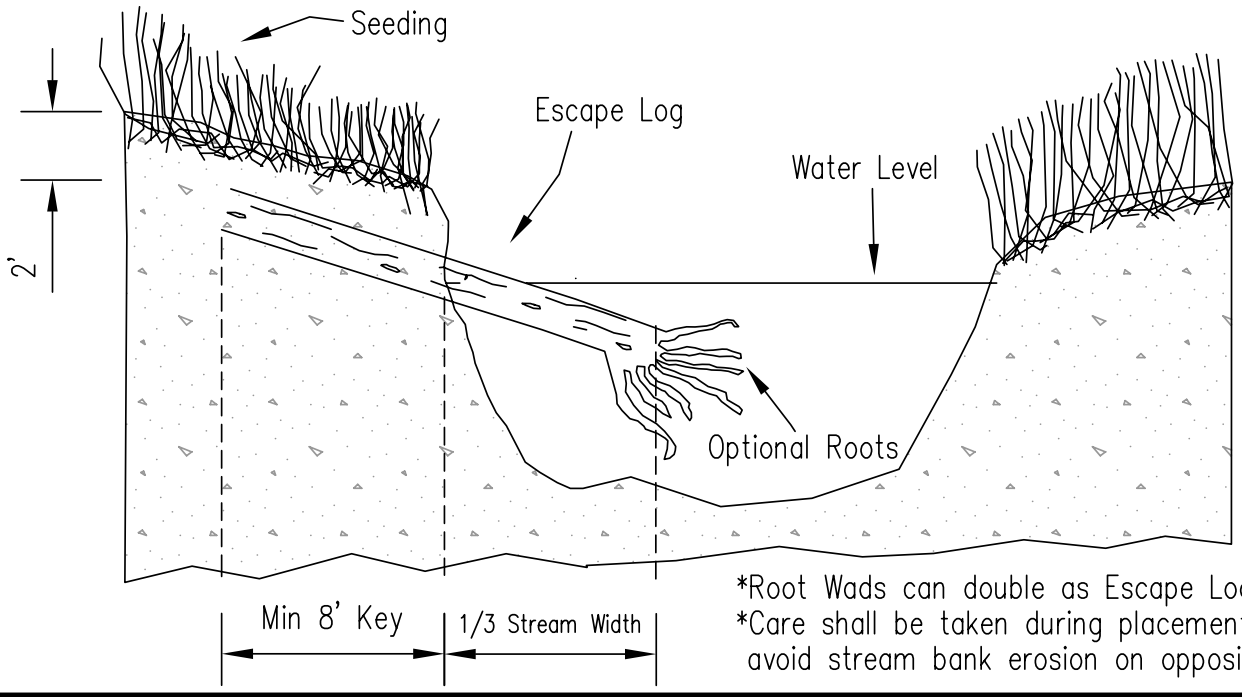

*Root Wads can double as Escape Logs.
*Care shall be taken during placement to avoid stream bank erosion on opposite bank.

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United States Department of Agriculture

ESCAPE LOG (DETAILS)
Page 1 of 1

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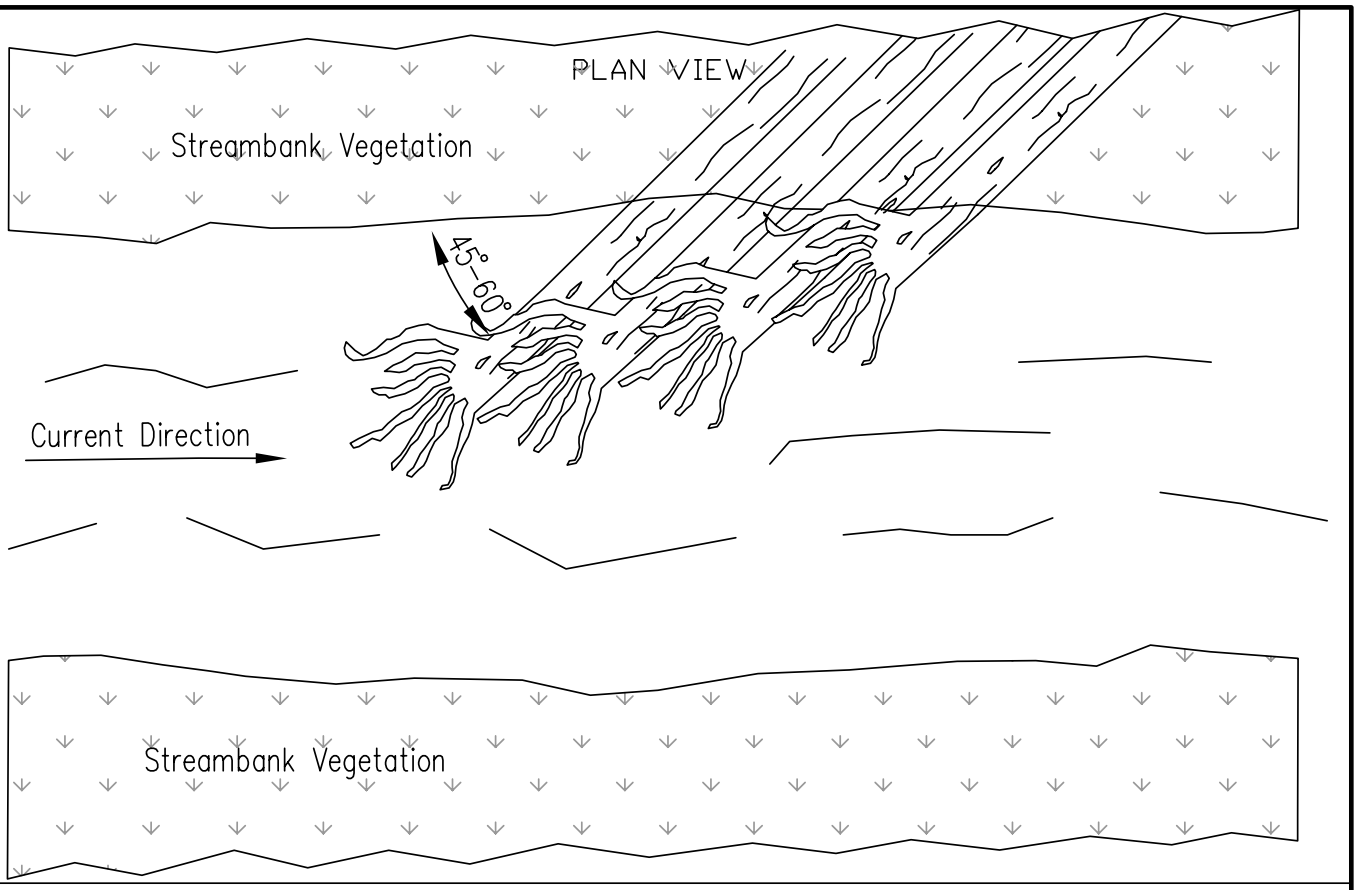

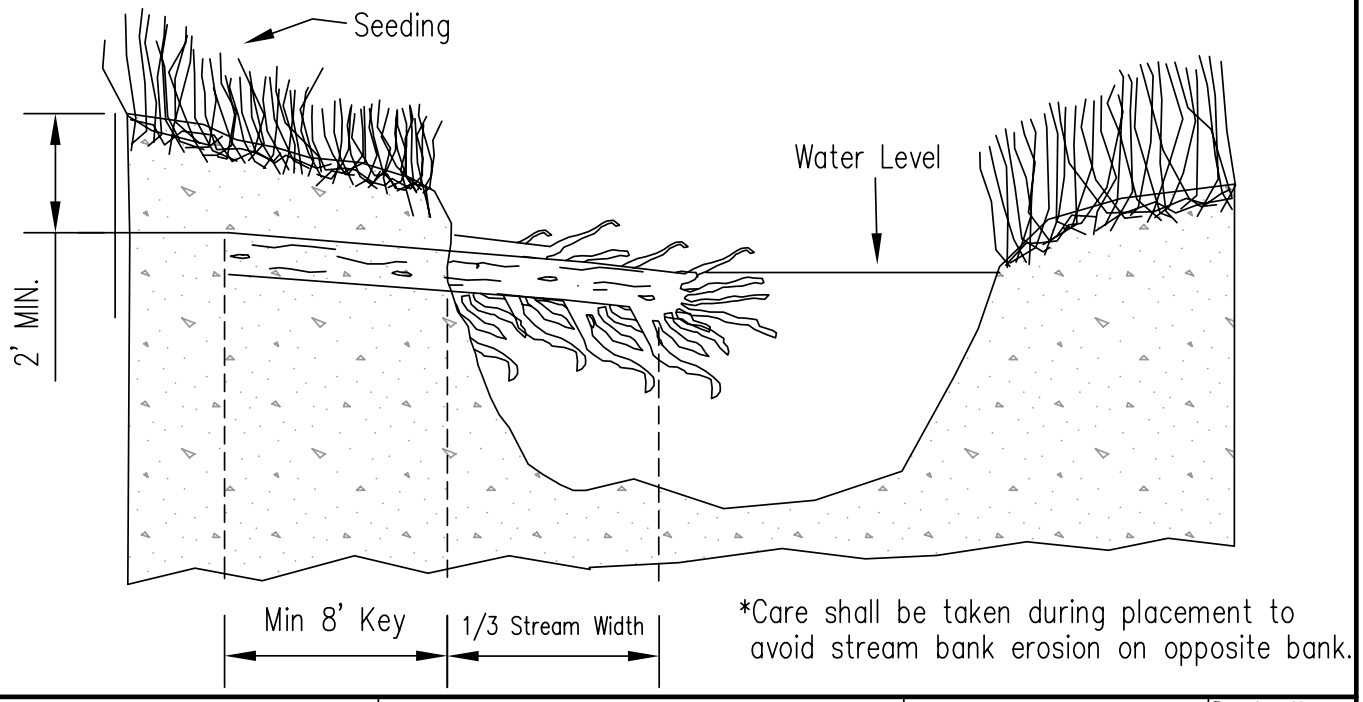

*Care shall be taken during placement to avoid stream bank erosion on opposite bank.

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United States Department of Agriculture

LOG DEFLECTOR (DETAILS)
Page 1 of 1

CLIENT: _____

COUNTY: _____

Date

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Date: 01/2007

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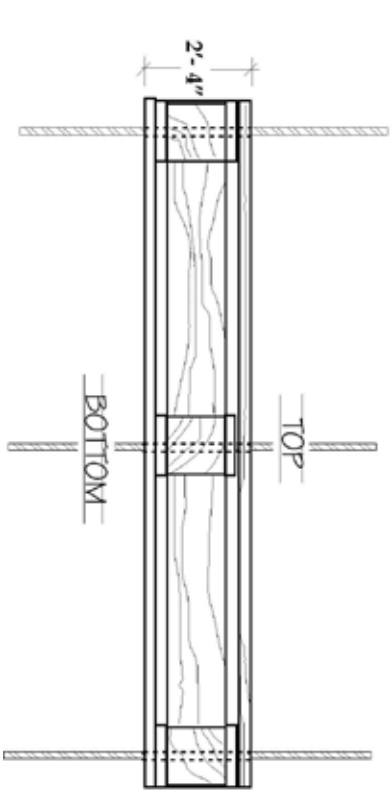
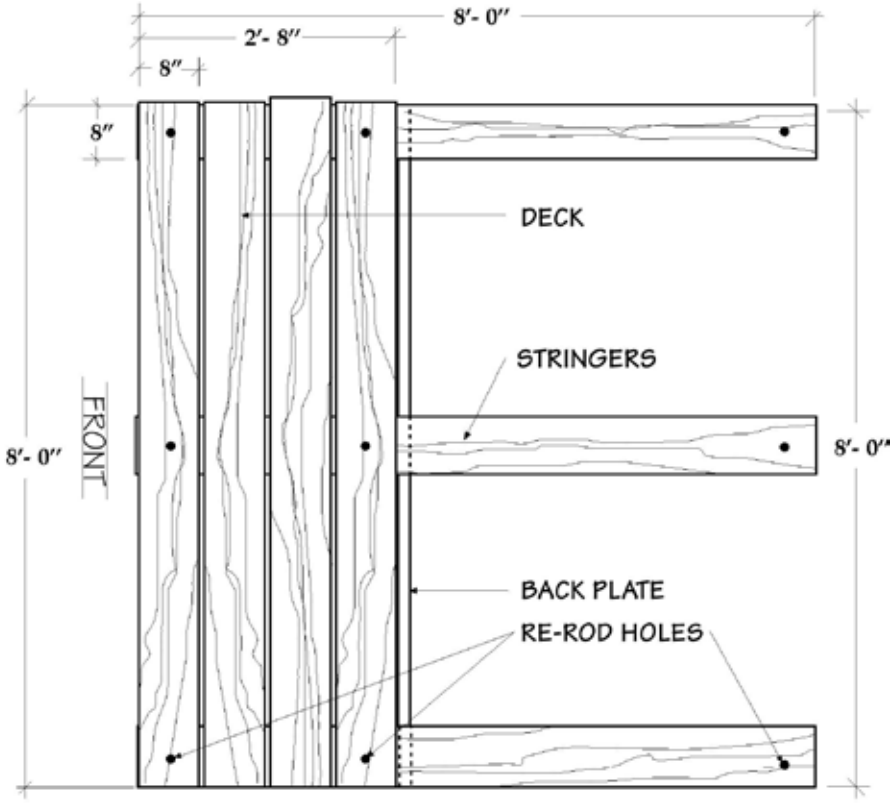
LUNKER

TROUT HABITAT STRUCTURE

(meets NRCS standards & design)



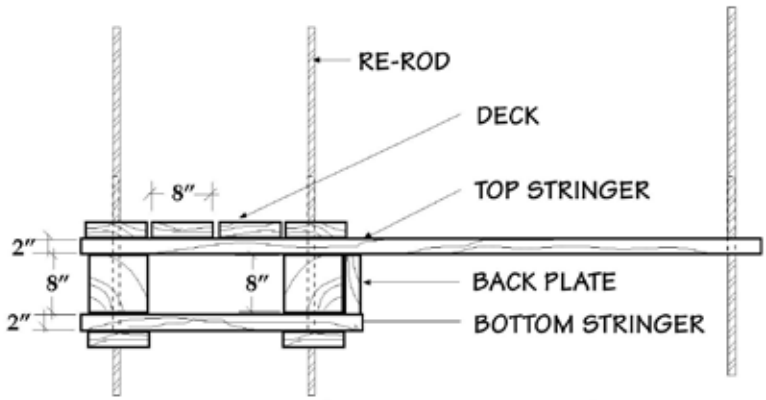
FRONT VIEW



TOP VIEW

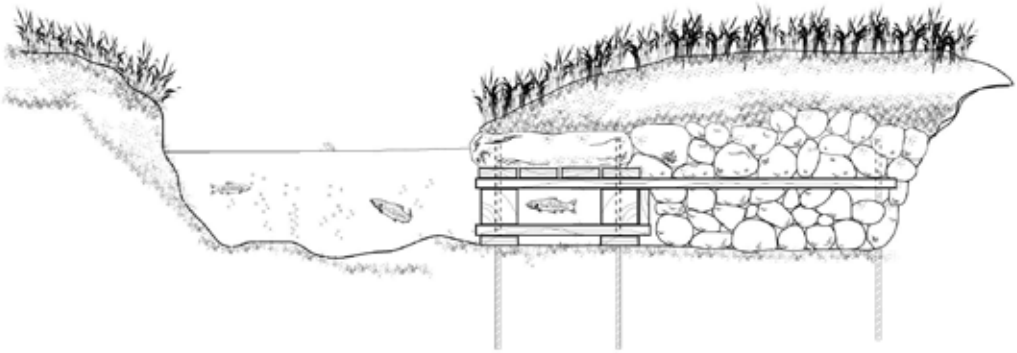
MATERIAL LIST

10 - 2" X 8" X 8'
3 - 2" X 8" X 3' STRINGERS
6 - 8" X 8" X 8" BLOCKS
9 - 3/4" X 5' RE-ROD



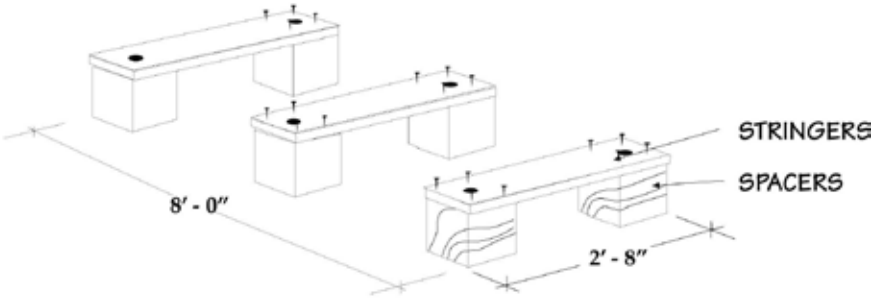
SIDE VIEW

LUNKER
ASSEMBLY INSTRUCTIONS



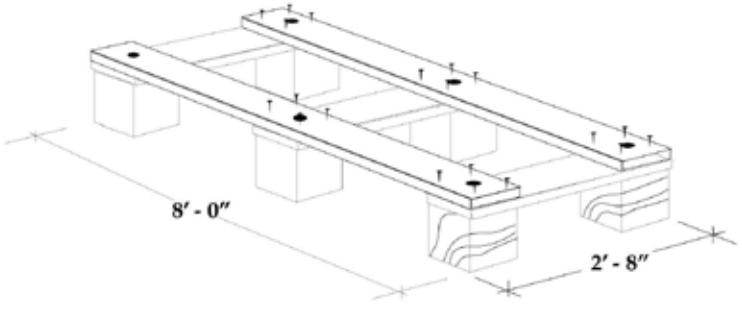
STEP 1

CUT SIX SPACERS, 8"X 8"X 8" AND PLACE THEM ON THE GROUND IN PAIRS WITH THE OUTSIDE EDGES 2' -8" APART AS ILLUSTSRATED BELOW. NAIL A 2"X 8" X 2'-8" OAK STRINGER BOARDS TO THE TOP OF THE SPACERS, MAKING SURE NOT TO PUT THE NAILS IN THE CENTER OF THE SPACERS BECAUSE THAT WILL BE DRILLED LATER TO ACCOMODATE A 3/4" RE-ROD.



STEP 2

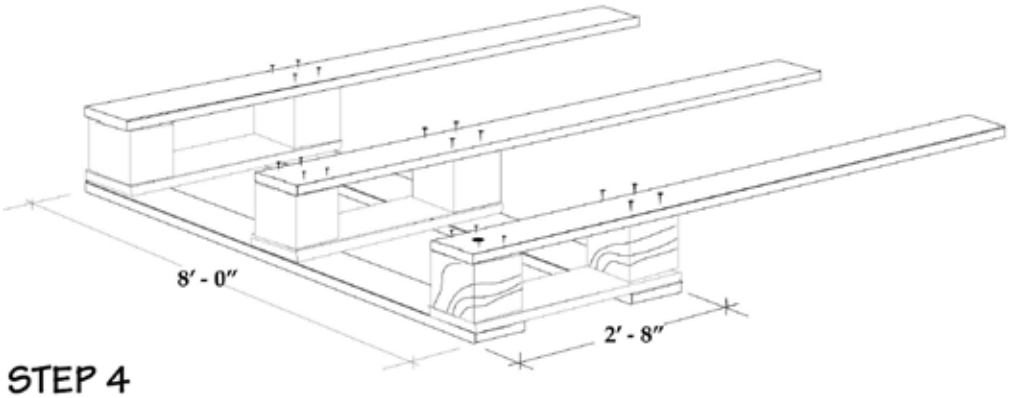
PLACE 2 - 2" X 8" X 8' LONG BOARDS ACCROSS THE 2' -8" STRINGERS AND NAIL IN PLACE TO TIE THE PAIRS TOGETHER,



LUNKER
ASSEMBLY INSTRUCTIONS

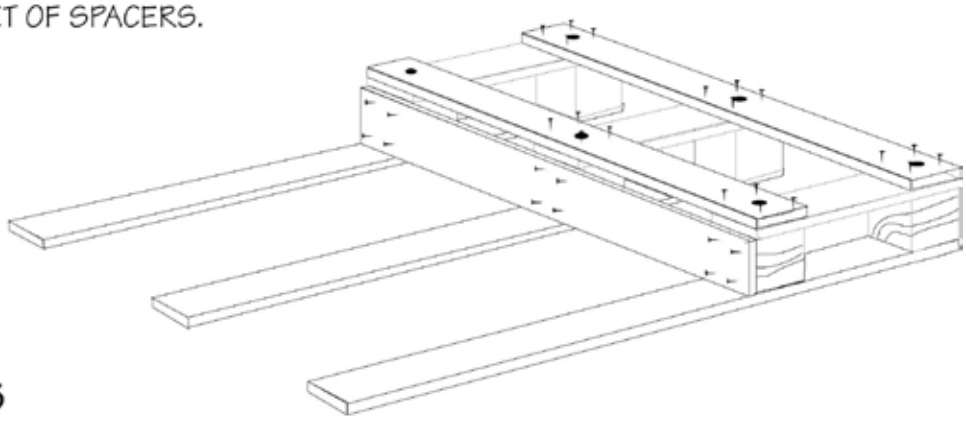
STEP 3

TURN THE STRUCTURE UPSIDE DOWN AND ATTACH 3 - 2" X 8" X 8' LONG STRINGER BOARDS TO THE BOTTOM OF THE 8" X 8" SPACERS, MAKING SURE THE TOP STRINGERS ARE RUNNING IN THE SAME DIRECTION AS THE SHORTER STRINGERS.



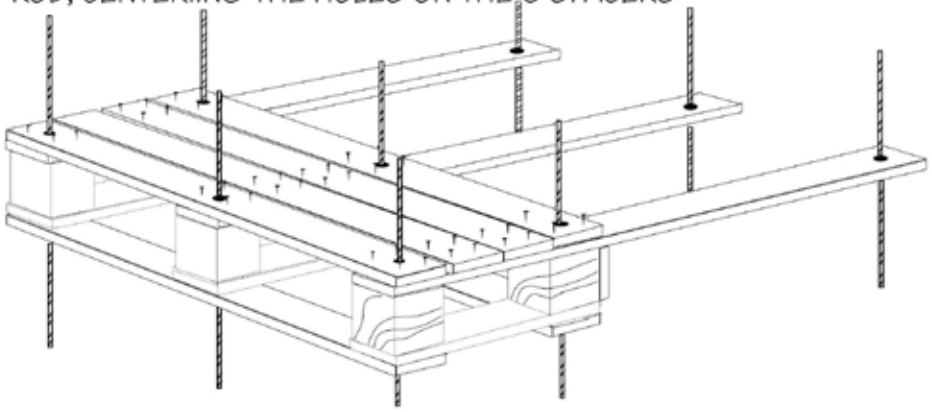
STEP 4

FLIP OVER AND NAIL A 2" X 8" X 8' BACKING BOARD ON THE BACK OF THE REAR SET OF SPACERS.

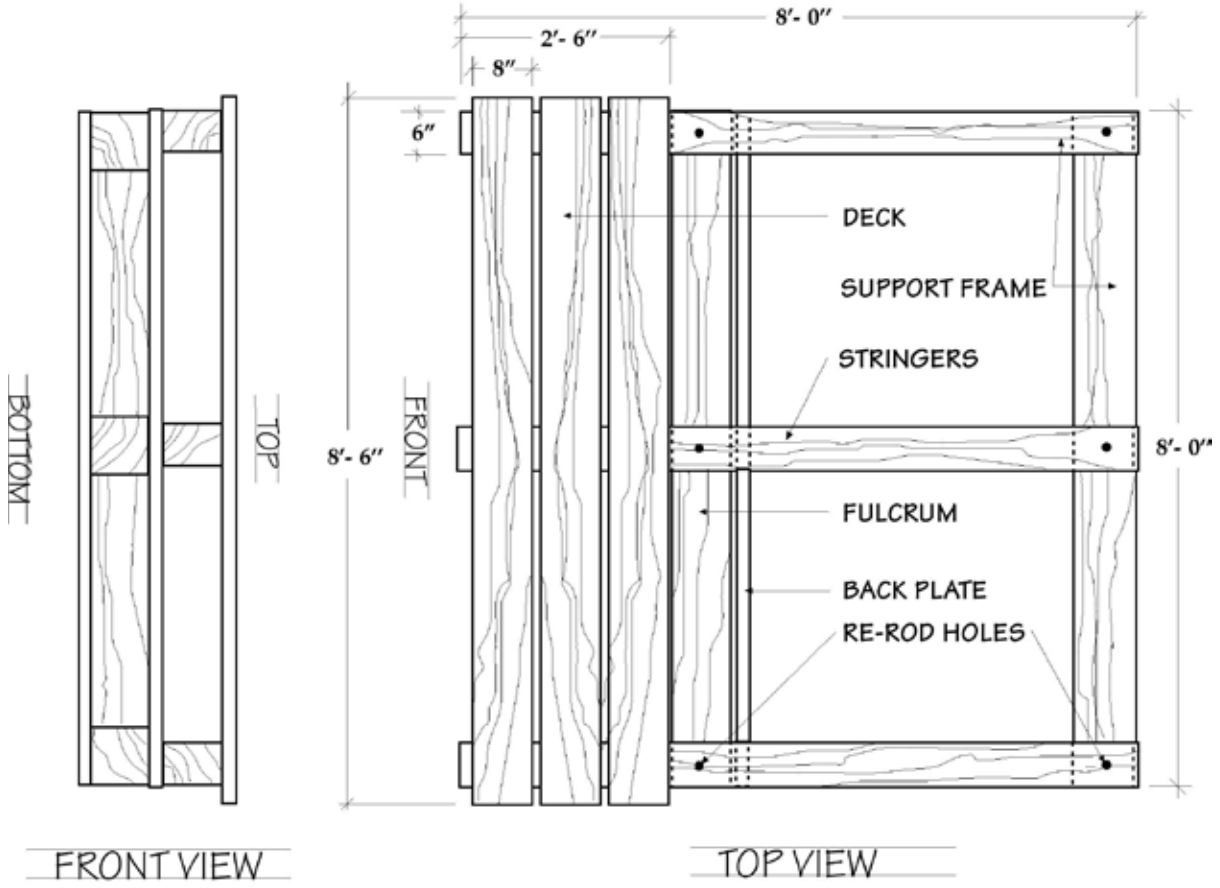


STEP 5

FLIP STRUCTURE OVER AND ADD 4 - 2" X 8" X 8' BOARDS TO CREATE A PLATFORM ON THE TOP FRONT OF THE STRUCTURE. DRILL 9 - 3/4" HOLES FOR RE- ROD, CENTERIING THE HOLES ON THE 6 SPACERS



MINNESOTA SKYHOOK
BANK OVERHANG STRUCTURE

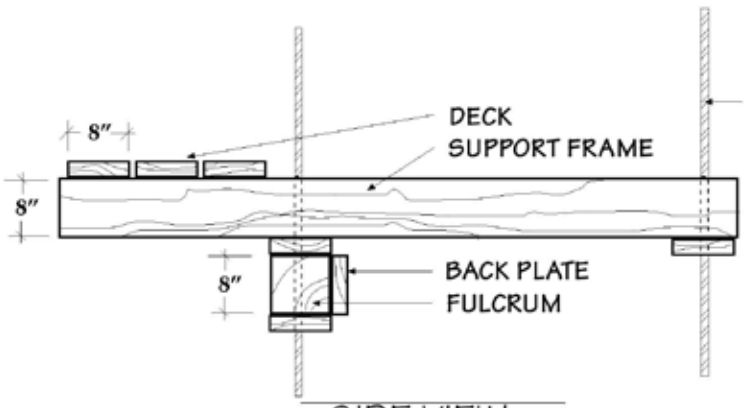


FRONT VIEW

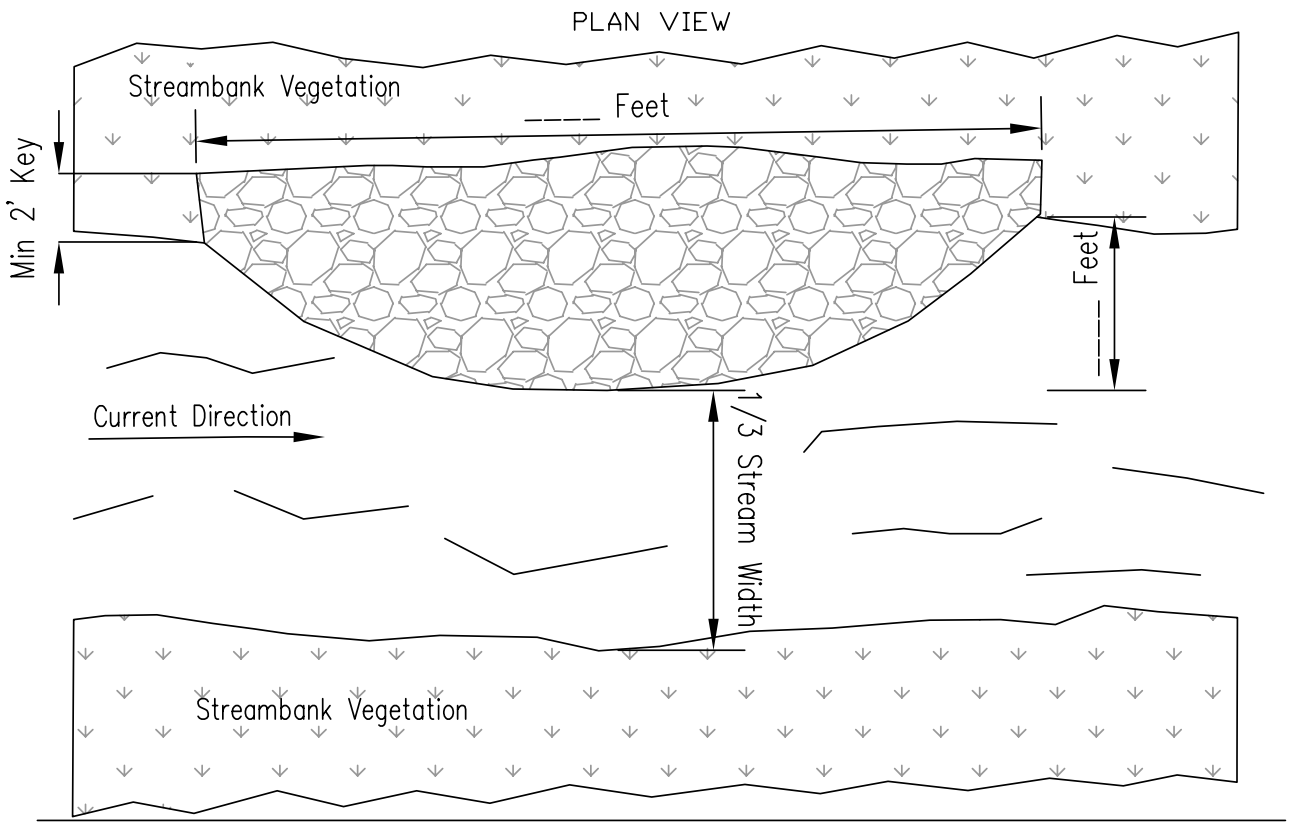
TOP VIEW

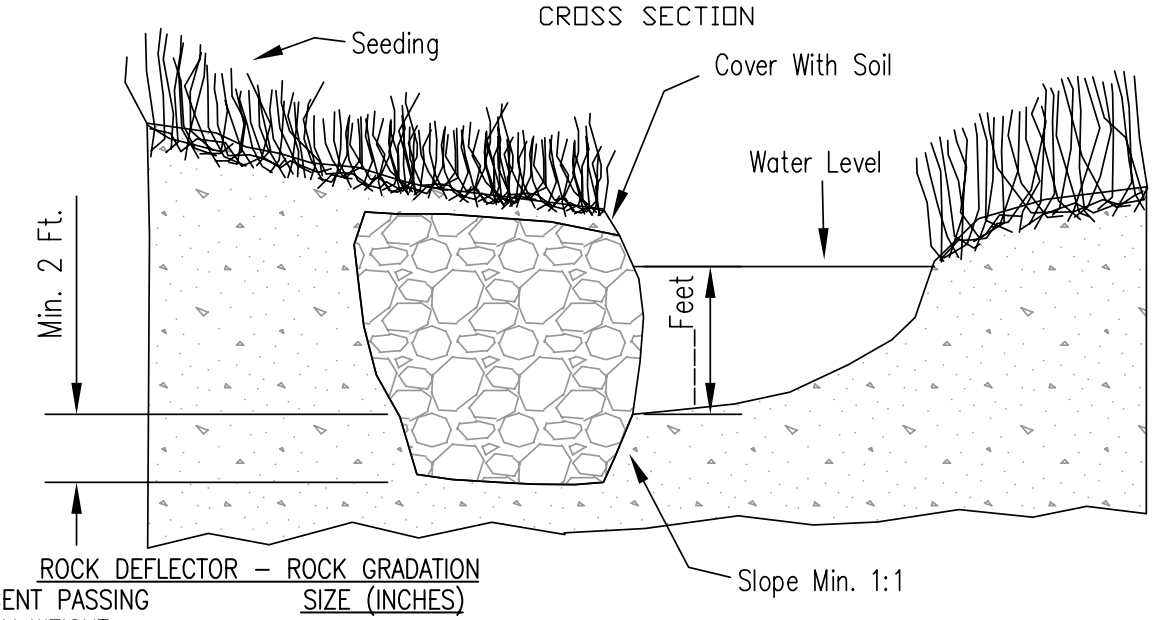
MATERIAL LIST

3 - 6" X 8" X 8'
7 - 2" X 8" X 8'-6"
3 - 8" X 8" X 8"
6 - 3/4" X 6' RE-ROD



SIDE VIEW





ROCK DEFLECTOR – ROCK GRADATION

PERCENT PASSING BY WEIGHT	SIZE (INCHES)
100	_____
60–85	_____
25–50	_____
5–20	_____
0–5	_____

*Care shall be taken during placement to avoid stream bank erosion on opposite bank.

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ROCK DEFLECTOR (DETAILS)
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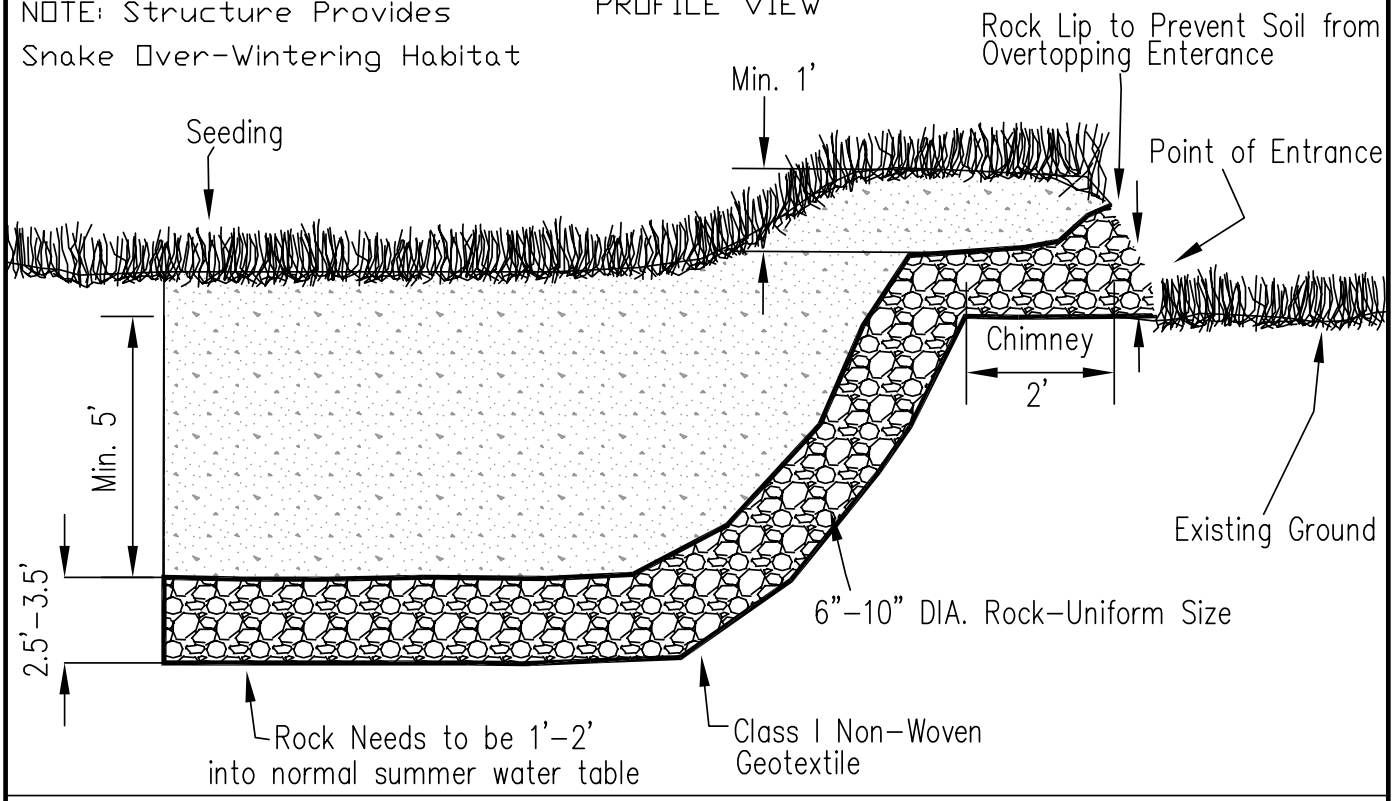
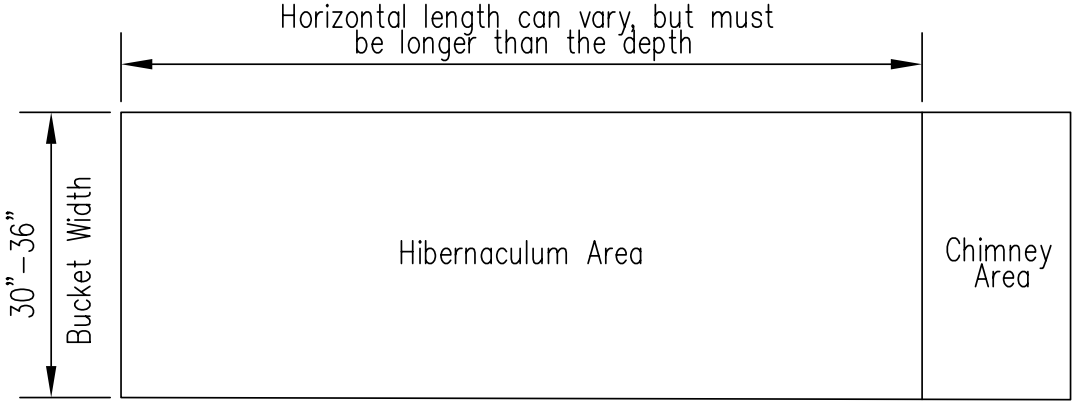
NOTE: Structure Provides
Snake Over-Wintering Habitat

PROFILE VIEW

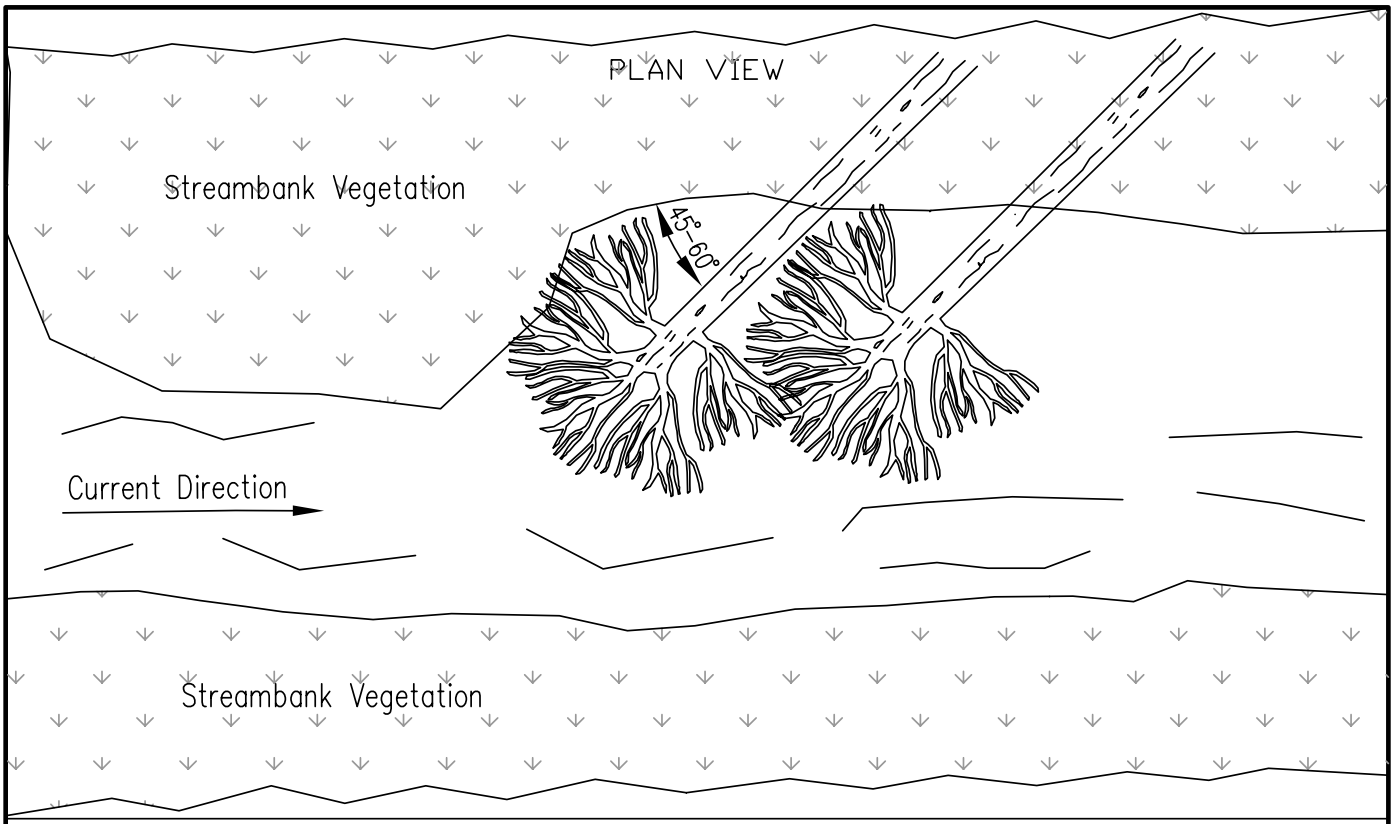


PLAN VIEW

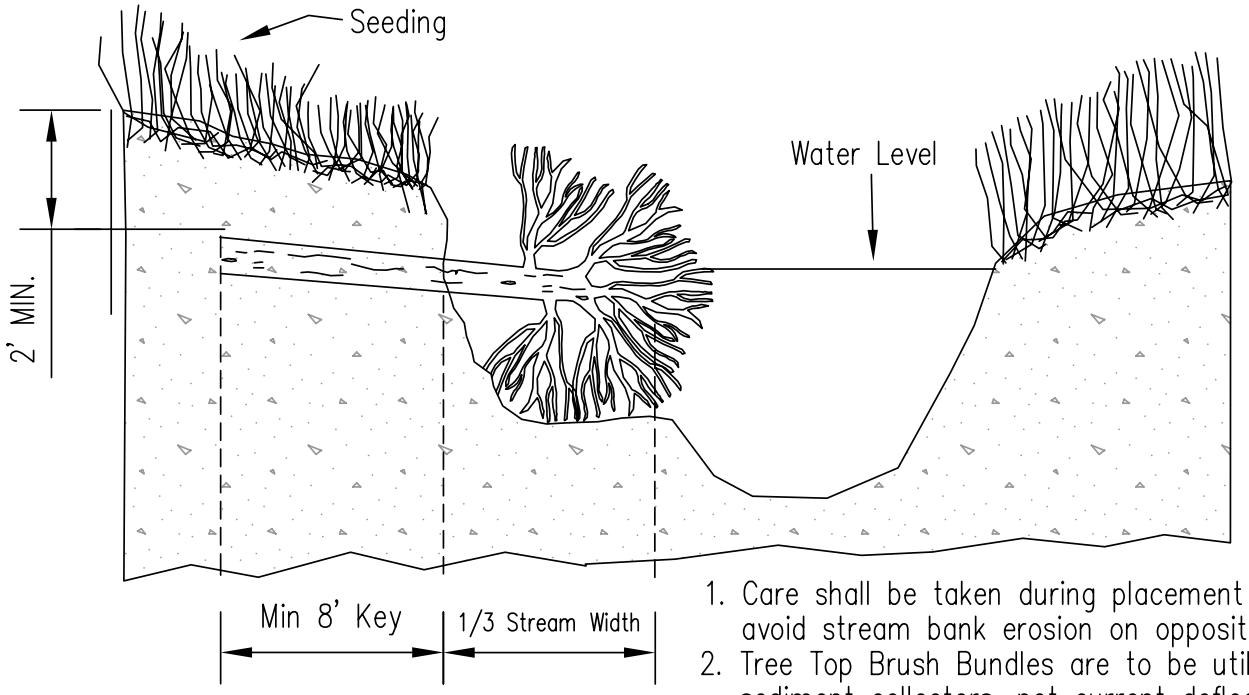


1. Hibernaculum should be placed out of the primary floodplain with a southern or western exposure.
2. A minimum of five feet of earth fill shall cover the rock-this acts as a buffer to maintain a hibernaculum temperature of at least 51 degrees Fahrenheit.
3. A soil berm may be required to isolate the hibernaculum from the river bank, to be flagged. by technician in the field.

NRCS Natural Resources Conservation Service United States Department of Agriculture	SNAKE HIBERNACULUM (DETAILS) Page 1 of 1 CLIENT: COUNTY:	Date Designed by: Drawn by: Checked by: Approved by:	Drawing No. Date: 01/2007 Sheet: of



CROSS SECTION



1. Care shall be taken during placement to avoid stream bank erosion on opposite bank.
2. Tree Top Brush Bundles are to be utilized as sediment collectors, not current deflectors.
3. Only non-invasive species shall be used.

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TREE TOP BRUSH BUNDLE (DETAILS)
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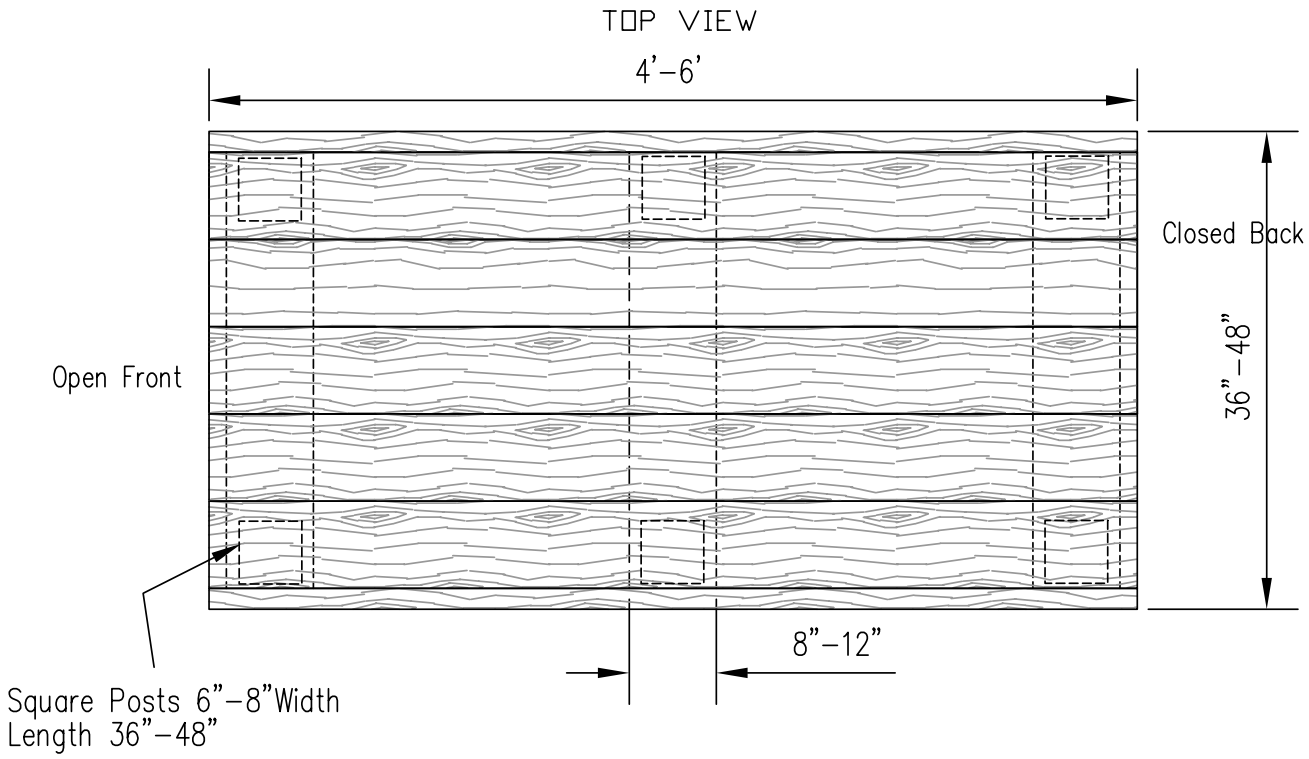
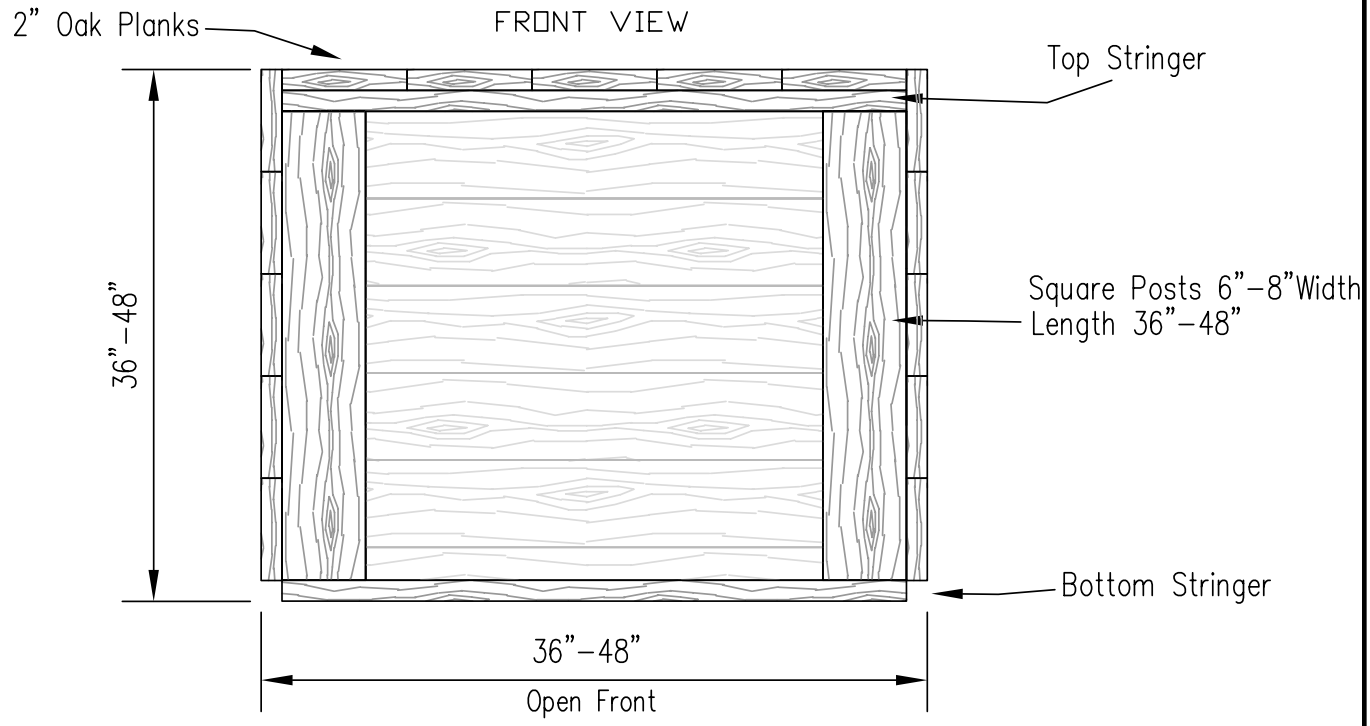
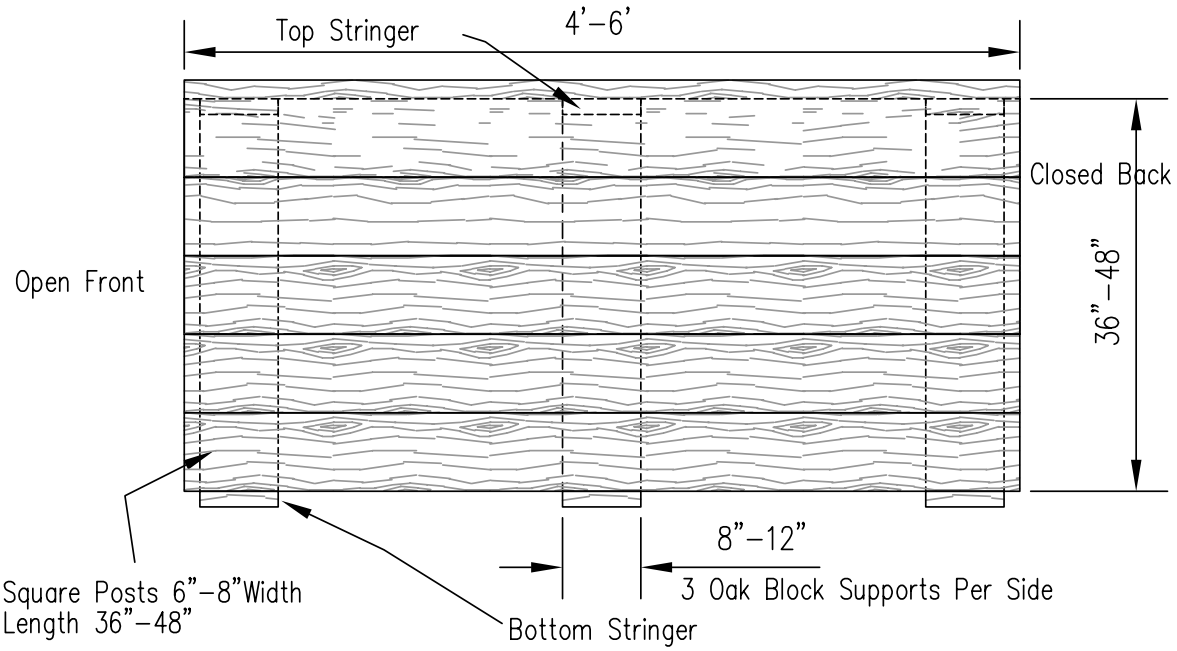




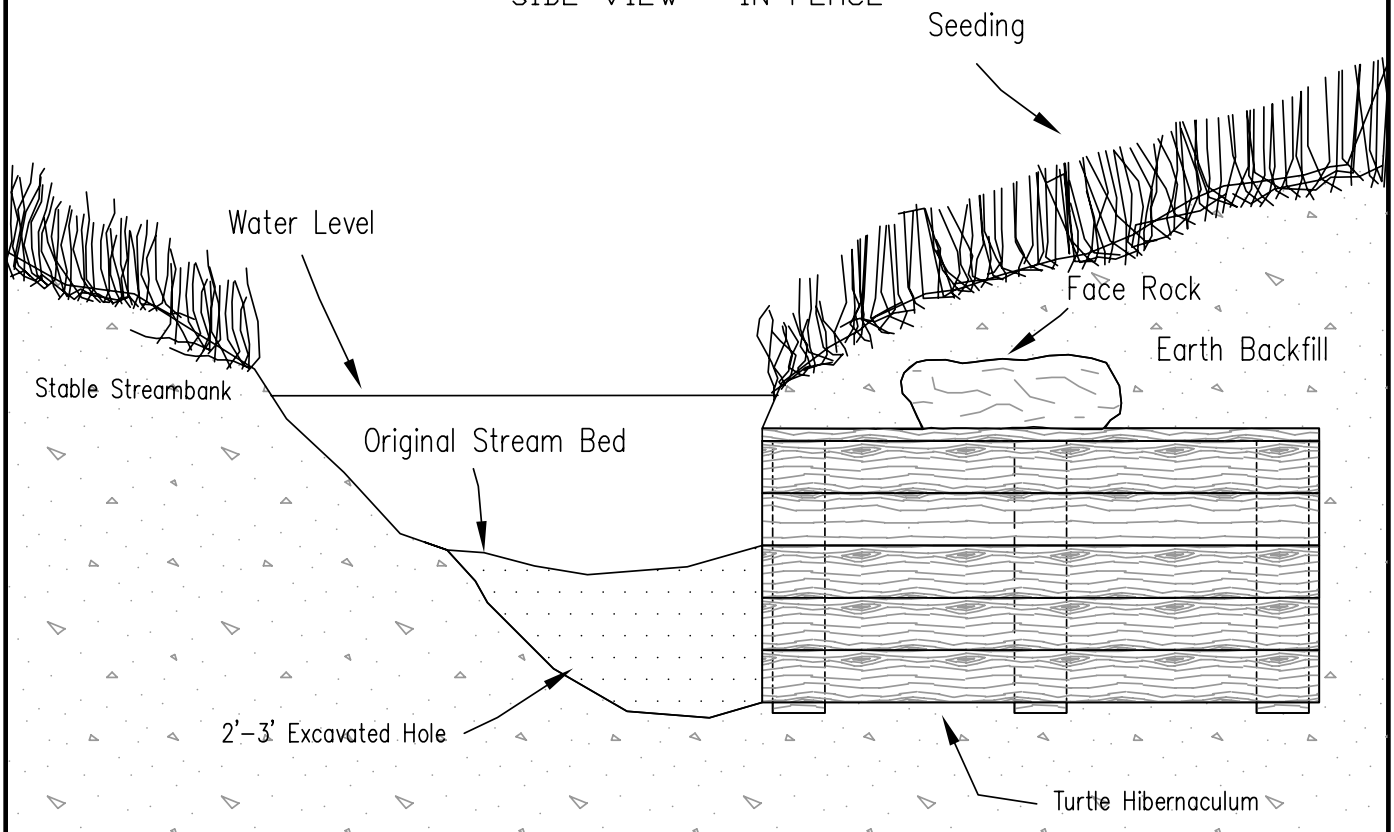
Structures are built using oak planks 2" thick by 8"–12" wide. Structures are nailed together with 20D ring shank nails.

NRCS Natural Resources Conservation Service United States Department of Agriculture	Under-Bank Turtle Hibernaculum (Details) Page 1 of 3 CLIENT: COUNTY:	Date Designed by: Drawn by: Checked by: Approved by:	Drawing No. Date: 01/2009 Sheet: of

SIDE VIEW



SIDE VIEW - IN PLACE



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Under-Bank Turtle Hibernaculum
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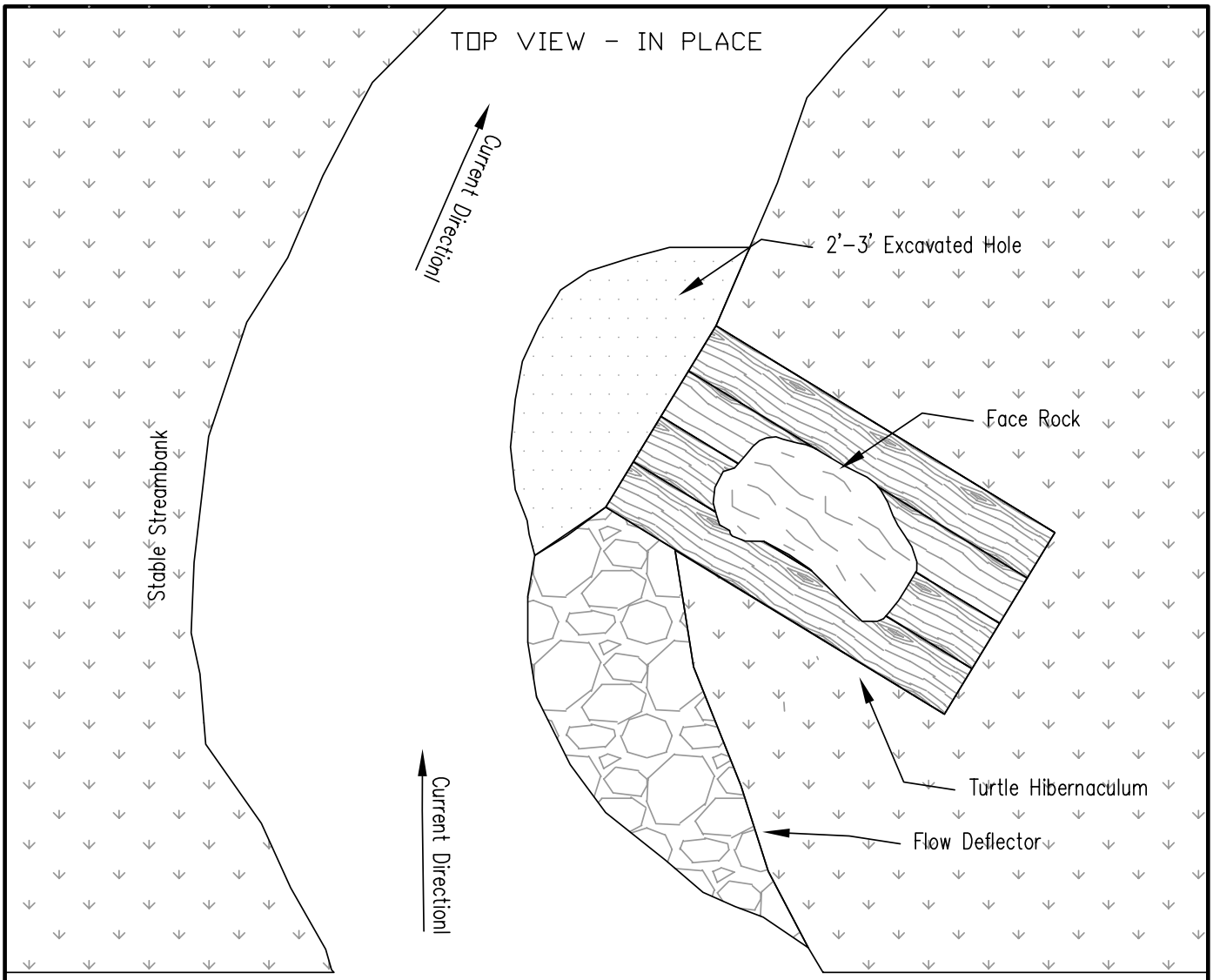

Turtle hibernaculum should be 3.0–4.0 feet deep and set into the bank 4–6 feet. The bottom of the hibernaculum should be a minimum of 2 feet below the existing stream bed to help accumulate a depth of at least 2 feet of fine sediments within the structure.

The hibernaculum should be placed directly behind a structure which deflects the flow of the stream causing a back eddy. This back eddy will be accentuated by digging a hole 2–3 feet deep in front of the hibernaculum to assist in fine sediment accumulation. This filling of fine sediment makes it suitable habitat for turtles to burrow into

QUANTITY ESTIMATE

2" OAK PLANK–8" WIDTH, 4–6' LENGTH (15–18/UNIT)	_____ EACH
SQUARE POSTS–6"–8" WIDTH, 36"–48" LENGTH (6/UNIT)	_____ EACH
2" OAK PLANK–8" WIDTH, 36"–48" LENGTH (6/UNIT)	_____ EACH (STRINGERS)
2" OAK PLANK–8" WIDTH, 36"–48" LENGTH (5–6/UNIT)	_____ EACH (BACKBOARDS)
20D RING SHANK NAILS	AS NEEDED

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Under-Bank Turtle Hibernaculum
(Details)
Page 3 of 3

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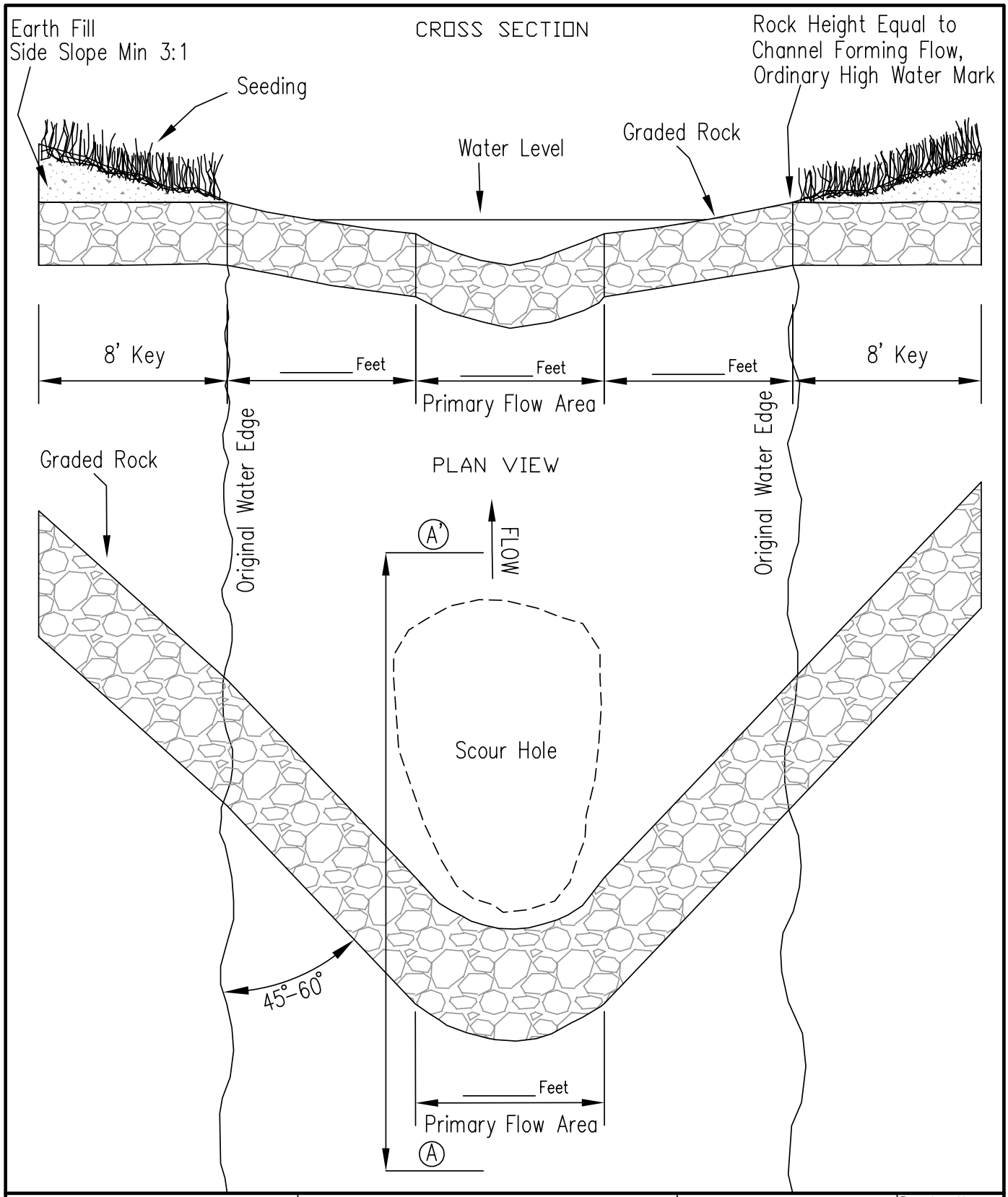

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VORTEX WEIR (DETAILS)
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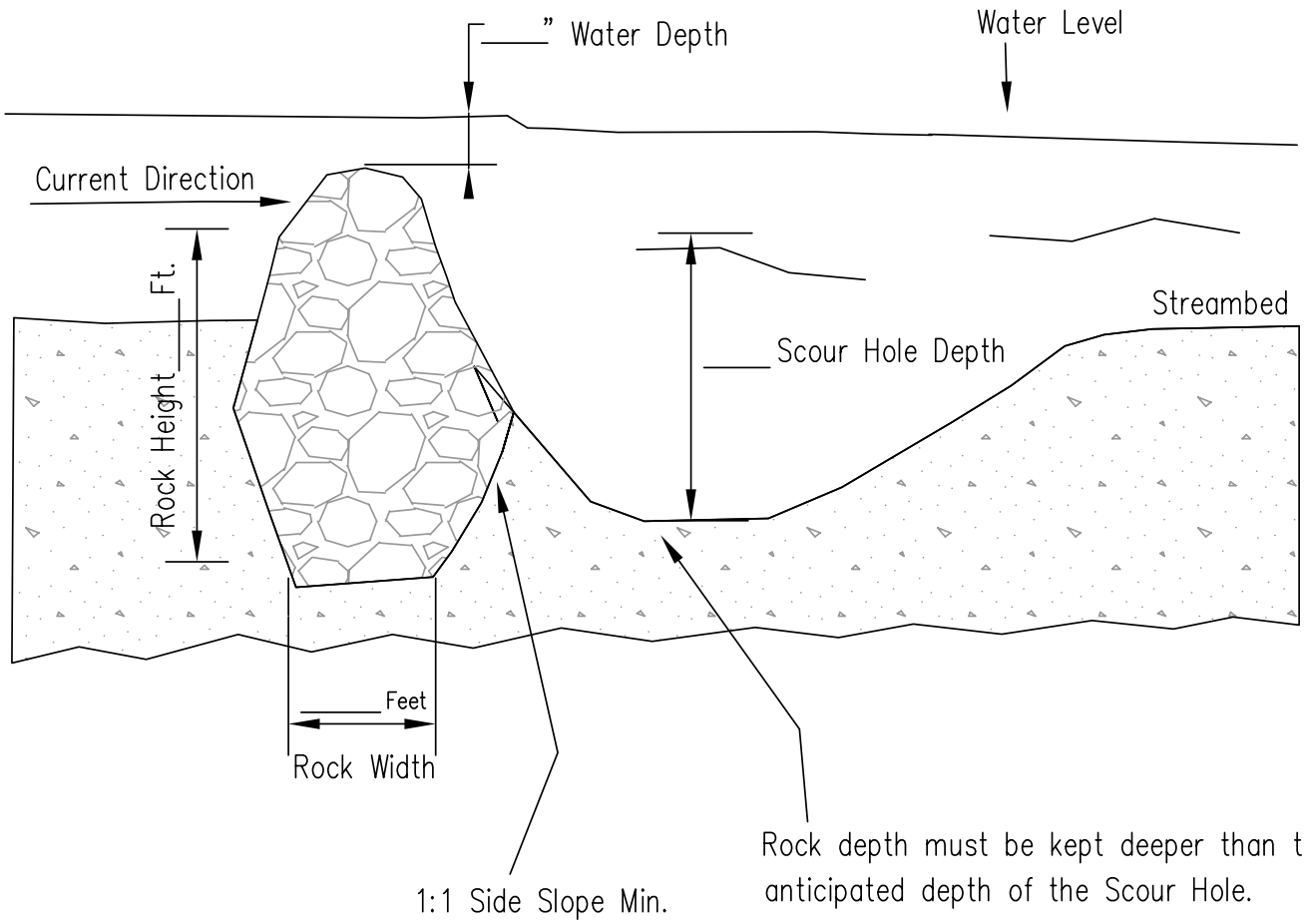
PROFILE VIEW
A-A'



DESIGNED GRADATION OF ROCK

PERCENT PASSING BY WEIGHT	SIZE (INCHES)
100	_____
60–85	_____
25–50	_____
5–20	_____
0–5	_____

Root Wads, Boulder Retards or Escape Logs can be added to scour hole for added habitat enhancement.

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VORTEX WEIR (DETAILS)
Page 2 of 2

CLIENT: _____
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